LOMA LINDA UNIVERSITY

School of Medicine

Center for Health Disparities and Molecular Medicine

16th Annual Health Disparities Research Symposium

Education –Development – Research – Health Disparities – Community
NCMHD Research Center of Excellence

PROGRAM, BIOS & ABSTRACTS

Wednesday, August 3, 2016
12:00 pm – 8:00 pm
Wong Kerlee International Conference Center
Loma Linda University School of Medicine
Loma Linda, California

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Molecular Medicine

LOMA LINDA UNIVERSITY SCHOOL OF MEDICINE

16th Annual Health Disparities Research Symposium

Wednesday, August 3, 2016
12:00 pm-8:00 pm, Wong Kerlee International Conference Center

Agenda

Distinguished Health Disparities Seminar Series

12:00 – 1:15 pm — **"From Dirt Roads to the Oval Office"**
Gayle R. Slaughter, PhD

Poster Session

2:30 pm – 5:00 pm — **Poster Presentations by Research Fellows**
LLU-NIH IMSD, MD/PhD Program
Apprenticeship Bridge to College Program (ABC)
Undergraduate Training Program (UTP)
Medical Training Program (MTP)
Summer Undergraduate Research Fellowship (SURF)

5:00 pm – 5:30 pm — **Flash Presentations by Selected Students**

Johnny D. Figueroa, PhD
Assistant Professor
Department of Basic Sciences
Member, CHDMM
School of Medicine

Evening Program

5:30 pm – 8:00 pm

Welcome — **Daisy D. De Leon, PhD**
Assistant to the Dean for Diversity
Professor of Physiology and Pharmacology
Department of Basic Sciences
Co-Investigator and Core Director, CHDMM
School of Medicine

Invocation — **Kimberly Payne, PhD**
Associate Professor
Department of Pathology and Human Anatomy
Member, CHDMM
School of Medicine

Remarks — **H. Roger Hadley, MD**
Dean, School of Medicine
Executive VP, Medical Affairs, LLUAHSC
School of Medicine

Remarks — **Penelope Duerksen-Hughes, PhD**
Associate Dean for Basic Sciences Faculty & Translational Research
Chair, Department of Basic Sciences
Professor of Biochemistry
Member, CHDMM
School of Medicine

Remarks

Marino De Leon, PhD
Director, CHDMM
Director/PI, LLU-NIH IMSD Program
Professor of Physiology
Department of Basic Sciences
School of Medicine

Introduction of Keynote Speaker

Marino De Leon, PhD
Director, CHDMM

Keynote Speaker

Gayle R. Slaughter, PhD

Senior Associate Dean for Graduate Education and Diversity
Professor of Molecular and Cellular Biology
Baylor College of Medicine

"The Impact of Diversity: From an Institution to the Nation"

Gayle Slaughter, PhD, earned a BS in chemistry from Northwestern State University of Louisiana and a PhD from Iowa State University. Her post-doc at Baylor College of Medicine was supported by an NIH post-doc fellowship. An NIH New Investigator Award and NIH R01 grant preceded her promotion to Assistant Professor of Molecular and Cellular Biology. A tenured professor and Senior Associate Dean of Graduate Education and Diversity, she has been an invited speaker for an international and two national research conferences on reproductive biology. She has served as a reviewer for a number of scientific journals, on the Review Board of the Texas Affiliate of the American Heart Association, the NIH Reproductive Biology study section, the NSF Physiological Processes study section, and review panels for educational programs to promote diversity and training.

She developed and directs programs that serve the nationally acclaimed SMART program, the IMSD program with 118 underrepresented PhD alumni, and an IRACDA post-doc research/teaching program helping transform curricula at three Houston universities. She wrote a guidebook for students, *Beyond the Beakers: SMART Advice for Entering Graduate Programs in Science or Engineering*. Her programs have been funded for nearly $30 million from The Pew Charitable Trusts, DeBakey Medical Foundation, Lyondell Petrochemical Company, Robert and Janice McNair Foundation, National Science Foundation, NIH, Sharney Foundation, Powell Foundation and Brown Foundation. She won Baylor College of Medicine's top education award, Molecular and Cell Biology's first service/education award, and the US Presidential PAESMEM award for mentoring and serving as Chair of the GREAT Group. She recently received the Houston Woman on the Move award and commendations from the city of Houston and the Texas Senate for her leadership of programs that help developing scientists establish their careers. She has given 500 talks, including 30 for national conferences, on science and careers.

Acknowledgement of Students

Carlos A. Casiano, PhD
Associate Director, CHDMM
Professor of Microbiology and Molecular Genetics
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School of Medicine

Daisy D. De Leon, PhD
Assistant to the Dean for Diversity
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Department of Basic Sciences
Co-Investigator and Core Director, CHDMM
School of Medicine

Susanne B. Montgomery, PhD
Associate Dean for Research
Professor of Social Work and Social Ecology
School of Behavioral Health
Director, Community Engagement and Education Core, CHDMM

Kylie Watts, PhD
Assistant Professor of Microbiology
Department of Basic Sciences
Director, SURF
School of Medicine

Final Remarks and Acknowledgements

Marino De Leon, PhD

LOMA LINDA UNIVERSITY SCHOOL OF MEDICINE
CENTER FOR HEALTH DISPARITIES AND MOLECULAR MEDICINE
16TH ANNUAL HEALTH DISPARITIES RESEARCH SYMPOSIUM

The Loma Linda University (LLU) Center for Health Disparities and Molecular Medicine (CHDMM) is a National Institutes of Health (NIH)-designated Center of Excellence in health disparities research and training. The CHDMM is funded in part by an award from the National Center on Minority Health and Health Disparities, NIH (P20 MD006988), and an educational research training award, the "Initiative for Maximizing Student Development" **(IMSD)** program, funded by the National Institute of General Medical Sciences, NIH, (2R25 GM060507). Integrating these programs at the CHDMM has provided synergy to our research and educational goals at the Loma Linda University School of Medicine (LLUSM). The CHDMM has four integrated cores: (1) Administration, (2) Research, (3) Research Training and Education, and (4) Community Outreach and Partnership.

The ultimate objective of the CHDMM is to eliminate health disparities by researching contributing biological factors, identifying and removing barriers that prevent underrepresented students from entering biomedical careers, and partnering with key community and government organizations. The focus of the biomedical translational research projects of the CHDMM is to explore the connection between the Augmented State of Cellular Oxidative Stress (ASCOS) and health disparities diseases such as certain cancers, diabetes and stroke.

A pivotal goal of the educational program is to increase the number of students from underrepresented groups and medically underserved communities that graduate with a PhD or MD/PhD degree in the biomedical sciences at LLU. The educational program supports highly qualified high school, undergraduate, graduate (PhD and MD/PhD), and medical students at LLU. Overall, the CHDMM supports a minimum of 50 students per year.

Promising high school and undergraduate students participate in the Apprenticeship Bridge to College **(ABC)** Program and the Undergraduate Training Program **(UTP)** respectively**,** during an 8-week summer research and academic experience. The programs incorporate scientific mentoring as well as participation in scientific seminars and lectures, with supplemental educational enrichment activities. In addition, students are given opportunities to attend national scientific meetings to make research presentations based on their summer experiences. Students are compensated competitively for participating in the program.

The Medical Training Program **(MTP)** provides research experiences for medical students at LLUSM who are interested in integrating biomedical research and health disparities research into the practice of medicine. Selected medical students are matched with prominent scientists in the basic science departments and collaborate jointly in scientific research projects. Students are required to attend scientific seminars, special lectures, and research colloquia.

Doctoral students in the basic science departments at LLUSM participate as NIH graduate fellows in the IMSD program. Successful applicants are awarded all tuition and fees in addition to a generous stipend/salary for living expenses. The program also incorporates participation in enrichment activities along with scientific seminars and special lectures. LLU-NIH IMSD fellows participate in well-structured research and educational activities that promote career development.

ACKNOWLEDGEMENTS

We would like to acknowledge the contributions of all who were instrumental in making this 2016 Health Disparities Research Symposium successful. Teamwork, cooperation, and flexibility are just a few of the skills necessary to successfully implement such a dynamic research program.

2016 Faculty Research Mentors

Erik Behringer, PhD
Juan Carlos Belliard, PhD
Abigail Benitez, PhD
Eileen Brantley, PhD
Carlos Casiano, PhD
Daisy De Leon, PhD
Marino De Leon, PhD
Penelope Duerksen-Hughes, PhD
Johnny Figueroa, PhD
Hansel Fletcher, PhD
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William Langridge, PhD
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Chris Perry, PhD
Reinhard Schulte, MD
Ryan Sinclair, PhD
Salvador Soriano, PhD
Richard Sun, PhD
Julia Unternaehrer, PhD
Marcelo Vazquez, MD, PhD
Nathan Wall, PhD
Charles Wang, MD, PhD
Chris Wilson, PhD
Sean Wilson, PhD
Xiaobing Zhang, MD, Ph

Key Personnel

Marino De Leon, PhD, Principal Investigator, CHDMM Director
Carlos Casiano, PhD, Co-Investigator, Associate CHDMM Director
Daisy De Leon, PhD, Co-Investigator, Core Director
Susan Gardner, PhD, Writing Consultant/Editor, Professor of English, Walla Walla University
Susanne Montgomery, PhD, Co-Investigator, Core Director
Nathan Wall, PhD, Project Director
Bertha Escobar-Poni, MD, Program Coordinator
Matt Riggs, PhD, Evaluator, Professor of Psychology, California State University, San Bernardino

CHDMM Administrative Staff

Ann Bradshaw – CHDMM Manager
Daniela Soto-Wilder, BS – Program Manager
Nannette Nevares – CHDMM General Operations
Debbie Rosentock – Office Aide

School of Medicine Office of Diversity

Venice Brown – 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.

2016 Student Research Fellows

ABC – Apprenticeship Bridge to College

Alejandra Beltran
Mina Botros
Christine Castanon
Kimberly Galindo
Lien Hardister
Andy Nguyen
Sabrina Rainsbury-Silva
Joshua Ramirez
Raquel Rodriguez
Kimberly Salazar
Kimberly Sibrian
Alexis Townsend
Ashley Vazquez
Cristian Vera-Torres
Nancy Zelaya

UTP – Undergraduate Training Program

Jared Abraham Rodríguez
Kwame Amponsah
Renissa Arnold
Samuel Bagley II
Carla Blum-Johnston
Rebecca Hernandez
Pablo Huerfano
Mariah Jackson
Dustin James
Danielle Little
Quincy Monroe
Angela Morales
Eunice Nyasani
Anna Gifty Opoku-Agyeman
Evelyn Sanchez
Claire Stewart
Erwin Stuffle
Anna White

MTP – Medical Training Program

Elysia Cohen
Kristoff Foster
Sarah Fowler
Yllen Hernandez
Franz Mendoza
Héctor Nieves
Maria Pagan
Arsenio Reyes Rivera

IMSD – PhD/MD-PhD Graduate Fellows

Ivana Alicea-Polanco
Christina Cajigas-Du Ross
Katherine Concepcion
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SURF – Summer Undergraduate Research Program

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Guest Participants

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Institutional Affiliations of Research Fellows

High Schools

Arroyo Valley High School
Beaumont High School
Bloomington High School
Eleanor Roosevelt High School
Etiwanda High School
Grand Terrace High School
Loma Linda Academy
Middle College High School
The Grove School
Vista del Lago High School

Universities

Andrews University
California Baptist University
California State University, Northridge
California State University, San Bernardino
Carnegie Mellon University
La Sierra University
Loma Linda University
Oakwood University
Ponce Health Sciences University, School of Medicine
San Juan Bautista School of Medicine
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Yale University

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LOMA LINDA UNIVERSITY SCHOOL OF MEDICINE

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Apprenticeship Bridge to College (ABC) High School Program

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Raquel Rodriguez
Kimberly Salazar
Kimberly Sibrian
Alexis Townsend
Ashley Vazquez
Cristian Vera-Torres
Nancy Zelaya

ALEJANDRA BELTRAN

ABC PARTICIPANT 2016

As I enter my last year at Grand Terrace High School, I hope to further build my student profile in order to attend Duke University fall of 2017and major in biomedical engineering along with the classes for premed. Afterward, my goal is to attend Harvard Medical School. I aspire to become a neurosurgeon while also being able to conduct research. The human brain is a fascinating, complex system in our body, and I would love to plunge into its unknown territory.

I have spent my high school career being a part of the Legacy Regiment Band and Colorguard. I, specifically, am a part of the colorguard and have learned to love this beautiful sport. I love the challenges brought on by my instructors to try a new toss or to learn to catch a flag behind my back. It causes me to think about every move I make, developing my problem solving skills. My mental development allows me to remember a four-to-eight minute routine. Being a part of this team has brought great memories and friends and shaped me into the person I am today.

Now, I am a part of Dr. William Pearce's lab focusing on perinatal biology. My mentors and lab partner, Wendy Osorio, have made the life of research interesting. My mentors helped me understand and achieve my project due to their guidance and patience. This program further affirmed my desire to have a career in the medical field and has allowed me to expand my knowledge greatly in a matter of eight short weeks. I hope to return to my lab for many years to come to continue and advance my research.

USING NEUN AND FLUORO-JADE C TO FIND THE INFARCTION SIZE OF BRAIN TISSUE AFTER TRAUMATIC BRAIN INJURY

Alejandra Beltran, Lara Durrant, Desirelys Carreon, Adam Vergara, Wendy Osorio, William Pearce

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

Traumatic brain injury (TBI) often occurs after a sports-related accident or car accident. It causes neurons in the brain to die or begin to degenerate. TBI can cause major health problems since new neurons are not made to replace degenerating ones. We are employing the use of Neuronal Nuclei (NeuN) and Fluoro-Jade C (FJC) in order to stain for neuronal degeneration in the brains of rats after TBI has occurred. Brain sections were dual stained with NeuN and FJC and colocalized in order to find the coefficients of infarction size on the brain tissue. The images produced from this experiment are being compared to images from two other dyes, cresyl violet and hematoxylin and eosin (H&E) in order to demonstrate the effectiveness of NeuN and FJC. NeuN is a neuronal specific nuclear protein observed in most neuronal cell types throughout the nervous system of adult rodents. It may be an early marker of neuronal differentiation and may be important in nervous system development and function. NeuN is expressed almost exclusively in the nervous system, appearing early in development and persisting in the adult. FJC is a newly developed dye similar to its predecessors Fluoro-Jade and Fluoro-Jade B. FJC is said to produce the greatest signal to background and the highest resolution images. It is also highly resistant to fading and is the most sensitive of the dyes, requiring the least amount of concentration and lowest staining time. NeuN and FJC were useful in staining mature and degenerating neurons, respectively. NeuN colocalized with FJC allowed us to find the infarction size of brain tissue in the cerebral cortex after TBI. We hope to further this study by optimizing the protocols to be used on neonatal rat brains.

MINA BOTROS

ABC PARTICIPANT 2016

Lao Tzu once said, "The journey of a thousand miles begins with one step." I never knew that one step was going to be taken 8 years ago as I stepped off the plane from Egypt onto U.S. soil. It was not just my luggage I brought to America, for I carried with me my dedicated mindset and work ethic to take advantage of opportunities provided for me. I then vowed to become a valuable asset to society by giving back and helping people that started out like me. Science and medicine have become gateways where I am able to use the abilities I was blessed with to achieve the goal I have had ever since I moved here. That one step I took has now led to graduating in the top of my class from Bloomington High School and continuing my journey at UC San Diego as a biochemistry major in the hopes of becoming a physician.

Aside from my academic and career path, I have also treaded the trails of various sports and clubs. Thanks to those tough practices on the basketball court and track, I was able to develop a competitive nature to get even more ahead. I also owe National Honor Society for elucidating my passion for helping people by allowing me to volunteer and be of service to my community. These weren't mere pastimes but also steps towards my goal.

Now I find myself working in Dr. Johnny Figueroa's lab in the Department of Neuroscience. It has become an experience that provides me with never-ending knowledge thanks to my mentor Ivana, and I am thankful for an opportunity such as the ABC program where I am able to continue my journey of a thousand miles.

DIETARY OMEGA-3 FATTY ACIDS IMPROVE FUNCTIONAL OUTCOMES WHILE PROTECTING THE NEUROVASCULAR INTEGRITY AFTER MILD TRAUMATIC BRAIN INJURY

Mina Botros, Sabrina Rainsbury, Ivana Alicea-Polanco, Andy Obenaus, Johnny Figueroa

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

Every year an estimated 42 million people suffer a mild traumatic brain injury (mTBI) or concussion. There is now substantial evidence that the consequences of mTBI are not always mild. Mild TBI is a major risk factor for stress-related and mood disorders, including post-traumatic stress disorder (PTSD). However, the mechanisms by which risk for PTSD may be increased following mTBI remain unclear. It has been hypothesized that disruption of the hippocampal neurovascular unit (NVU) homeostasis may play a crucial role in the development of PTSD following mTBI. This study investigates the effects of n-3 PUFAs on functional recovery and vascular integrity following mTBI in rats. Animals were fed for 4 weeks with either the control or the experimental (n-3 PUFA-rich) diet before being subjected to a mild controlled cortical impact. The dietary intervention continued after injury, and the rats were allowed to survive for 4-8 weeks following mTBI. PTSD-like behaviors were evaluated and brain imaging was performed. We found improved functional recovery and amelioration of PTSD-like behaviors in the animals consuming the n-3 PUFA diet. Furthermore, the animals consuming the n-3 PUFA diet showed improved hippocampal volumes following mTBI. Tomato lectin staining revealed increased vascular integrity in the animals consuming the n-3 PUFA-rich diet. Our results support the promising beneficial effects of these fatty acids in promoting brain resilience to injury. This study demonstrates that chronic dietary intake of n-3 PUFAs is an effective prophylactic measure to protect against mTBI while actively promoting neurovascular restorative dynamics.

CHRISTINE CASTAÑON

ABC PARTICIPANT 2016

In June, I graduated as the 2016 Salutatorian of Vista Del Lago High School in Moreno Valley, CA. I was awarded Senior of the Year as well as the departmental awards for Biological Sciences and Health Academy. This fall I will attend UCLA as a neuroscience major. It is intriguing to think that a structure as complex as the nervous system could lie within us and designate our body's every move. After completing my undergraduate degree, I aspire to attend medical school at UCLA or Stanford. In the future, I plan to become a sports medicine physician and work for an athletic team.

Education and family are my first priorities, but ballet is a close second. I began dancing at the age of 9 and began training at the age of 13 on scholarship. Throughout my dance career, I have danced as a soloist for "Waltz of the Flowers" and "Marzipan," Kitri from *Don Quixote*, and *La Esmeralda*. In addition, I was accepted to train with Los Angeles Ballet, but I graciously turned down the offer. I do plan to continue dancing throughout college with the hope of teaching ballet to young students who could not financially do so otherwise.

This summer, I have been fortunate enough to work in Dr. Julie Unternaehrer-Hamm's ovarian cancer research lab. She, along with my two mentors, Alyse and Maricella, have been beyond patient with me, and there are no words to explain how grateful I am to have worked with them. Psalm 121: 7-8 says, "The Lord will keep you from all harm—he will watch over your life; The Lord will watch your coming and going both now and forevermore." He has truly watched over me because without Him I would not be where I am today.

INVASION AND METASTASIS POTENTIAL OF OVARIAN CANCER STEM CELLS

Christine Castañon, Alyse Hill, Maricela Gallardo, Julia Unternaehrer

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

Ovarian cancer is the most lethal of all gynecological cancers because it is often diagnosed at a late stage. Therefore, by the time ovarian cancer is diagnosed, it has already progressed to stages III or IV. Current treatment options involve surgery and chemotherapy but are often ineffective for recurrent malignant tumor growth. It is thought that relapse is attributed to a subpopulation of tumor cells called cancer stem cells (CSCs). Three cell lines used as good models for high grade serous ovarian carcinoma were OVSAHO, OVCAR-8, and COV318. Using immunofluorescence microscopy, we labeled cancer cells with antibodies to identify specific biomarkers for cancer stem cells. We labeled the cells with primary antibodies that include CD133, ALDH, LIN28A, SSEA4, NANOG, and CD44, followed by fluorescent secondary antibodies and the DNA-labeling dye DAPI. OVSAHO was positive for Lin 28a and ALDH; OVCAR-8 for LIN28A, NANOG, CD44, and ALDH; and COV318 for NANOG and ALDH. Knowing that OVSAHO, OVCAR-8, and COV318 contained CSCs, we wanted to compare their invasiveness. We prepared the cells for a wound healing assay to evaluate the migratory rates of cell lines. The cells were treated with Mitomycin-C, a chemotherapeutic agent that inhibits the synthesis of DNA. This drug prevents mitosis so that gap closure is not due to cell proliferation. Two scratches were made in confluent layers of cells to test the percentage rate at which the wound closes or heals over a 24-hour period. OVCAR-8 had the largest wound recovery of 58.95%, followed by COV318 with a wound recovery of 22.45%, then OVSAHO with a wound recovery of 13.09%. Controls for these experiments include fibroblasts (negative for migration) and NCCIT (positive for pluripotency). We conclude that these ovarian cancer lines have a variable percentage of cancer stem cells and that high expression of cancer stem cell markers correlates with migratory ability.

KIMBERLY GALINDO

ABC PARTICIPANT 2016

The moment I was born, I was categorized as a minority. My brown skin, the marked tone of every phrase I spoke, and my tortilla making skills identified me as Mexican. I am proud of my heritage. The blood running through my veins is the same that ran through men who worked long hours in the fields, women who restlessly cared for many children, and wise elders. Regardless, it also meant I had to work extra hard not only to be more knowledgeable but to prove my capabilities. The color of my skin, at times, made me seem weak to others. They lacked seeing the fire born in me, a flame still in me.

I used to think I had to do things for personal ambition, but I realize now I did not do things only for myself. I did them because I had a community I had to make proud. My family members, each one of them, have passed down a story to me. My success is their success.

This past May, I graduated with my Associate's Degree, not an easy task, but my parents, my brother, my community also graduated with me. I sacrificed, as my ancestors did, for a brighter future. Last summer, in the ABC program, majoring in biochemistry and attending UCLA were my dreams. This summer, they are my reality. At UCLA's overnight program we chanted, "With our heart in our hands, and our hands in the soil" because wherever I go, I cannot forget where it all began and where I came from.

Dr. Salvador Soriano, who graciously took me into his lab again, is one of the reasons I work so hard. He inspired me in so many aspects of science for which I will forever be thankful.

CHARACTERIZATION OF THE AMYLOID PRECURSOR PROTEIN MUTANT THAT LACKS ITS CHOLESTEROL-SENSING DOMAIN

Kimberly Galindo, John David Jeppson, Brendan Gongol, Salvador Soriano

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

Alzheimer's disease (AD) is the most common form of dementia and the sixth leading cause of death in the U.S., yet its origins are still obscure. Most people identify it in the context of the amyloid cascade hypothesis. According to this hypothesis, the amyloid peptide Aβ, derived from the amyloid precursor protein (APP), accumulates in the brain. This accumulation causes senile plaques, which in turn lead to abnormal phosphorylation of tau, a cytoskeletal protein with a key role in axonal transport, eventually leading to neuronal loss and dementia. However, many other studies have shown that Aβ not only resides in victims of AD, but it can be found in the healthy population as well. Furthermore, clinical trials designed to reduce Aβ plaques have successfully done so but have shown no impact on disease progression. Our own lab has proposed an alternative model in which cholesterol oxidation is the more likely cause of AD. In that scenario, APP is a cholesterol sensor that initiates a protective response against excessive cholesterol oxidation. We have shown that this protective response does exist, both *in vitro* and *in vivo*, and it is lost in cells that harbor an APP form expressing the mutation G700A within the transmembrane domain, a mutation predicted to abrogate the cholesterol-sensing function of APP. While expression of this mutant APP leads to the loss of its protective function, its cholesterol-binding ability has not yet been demonstrated. Here, we hypothesize that the G700A mutation in APP leads to the loss of its cholesterol-binding function without affecting its overall intracellular traffic patterns. We use sucrose gradient subcellular fractionation, immunofluorescence and Western blotting analysis to characterize the cholesterol-sensing phenotype of wild type and G700A mutant forms of APP.

LIEN HARDISTER

ABC PARTICIPANT 2016

I am a seventeen-year-old student that will be entering my senior year at Eleanor Roosevelt High School. I am an inquisitive and passionate AP student exceling in academics as well as being actively involved in numerous extracurricular activities in and outside of school. I have been captain of the girls' golf team for the past two years, a member of Roosevelt's cheer team, and a competitive dancer in the genres of Jazz and Hip-Hop for about 10 years. In addition to participating in sport programs, I am also a member of various service, academic, and social clubs. California Scholarship Federation, Black Student Union, Youth Service America, and Red Cross are just some of the many clubs I have volunteered in. On the scholastic competitive level, I have participated in National History Day, studying the sociopolitical, economic, and cultural effects of the Harlem Renaissance on our country where I was awarded 1st place in my district and later advanced to the county level. I have a strong interest in science and plan on majoring in biochemistry with hopes of obtaining a medical degree in neurobiology.

My mentors are Dr. Nathan Wall, Ron Moyron, and Janviere Kabagwira in a biochemistry lab that specializes in cancer research. I am studying unique proteins found in exosomes, taken from patients who have suffered mild traumatic brain injuries (mTBI). Our research team is attempting to find a possible biomarker to better diagnose and treat mTBI. I am eternally grateful for Janviere's limitless patience, Ron's brutal honesty, and Dr. Wall's relentless encouragement. Through this program, I hope to further my love of neurobiology and fuel my passion to persevere and work diligently to become a neurosurgeon.

UNIQUE PROTEIN ANAYLSIS OF MINOR TRAUMATIC BRAIN INJURY PATIENTS

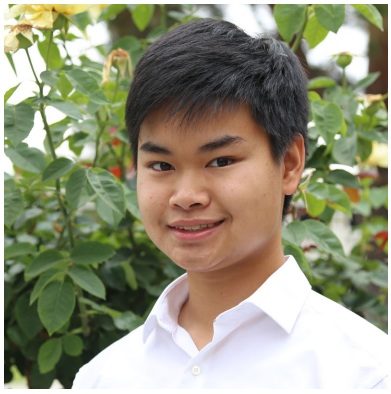
Lien Hardister, Ron Moyron, Janviere Kabagwira, Kimberly Salazar, Amber Gonda, James McMullen, Heather Ferguson, Nathan Wall

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

mTBI is a loss of memory, consciousness, or confusion onset by a traumatic event lasting approximately 30 minutes. For patients who have sustained mTBI, CAT and MRI scans typically come back clear, revealing no physical damage to the brain. Without physical damage, the only way to determine if brain trauma has occurred is a spinal tap; few patients consent to this procedure due to the high risk of being paralyzed. The focus of the study was to use plasma derived exosomes from those who suffered from a traumatic brain injury in order to analyze their proteins in search of a biomarker for mTBI. Patients were admitted to a level 1 trauma center and classified by their Glasgow Coma Scale (GCS) score into three groups: Group A, Group B/C, and Group D. Group A consisted of no trauma patients with a GCS of 15, Group B consisted of mild/ moderate trauma patients with a GCS of 9-14, and Group C consisted of severe trauma patients with a GCS of 3-8. Blood samples were drawn from each patient and the plasma was isolated. Patient plasma was treated with Exoquick, a proprietary exosome isolation kit developed by SBI, and exosomes were run in an agarose gel and analyzed using mass spectrometry. Smaller subsets of 5 patient proteins were analyzed from the larger n-number, 1 from each group. Patient A had 329 proteins, 17 unique to the patient. Patient B3 had 188 proteins, 6 unique to that patient, and patient B8 had 201 proteins, 8 unique to that patient. Patient D1 had 207 proteins, 9 unique to that patient, and D3 had 250 proteins, 10 unique to that patient. Our data suggest that proteins are unique to each GCS group and unique to each patient revealing that exosomes protein analysis yields positive results.

ANDY NGUYEN

ABC PARTICIPANT 2016



My mother once said, "The only way to succeed in life is through education." I am going to be the first generation college student in my family. I am a senior at Middle College High School and I attend San Bernardino Valley College concurrently. I began taking college courses when I was 13 years old, and I currently have 44 college units. I am projected to obtain an Associate's Degree simultaneously with graduating from high school. I plan to major in chemistry and become a pharmacist.

When I'm not sitting in class listening to long lectures, I spend my time tutoring other students. I am currently a chemistry and math tutor at San Bernardino Valley College. I have devoted over 300 hours of my time and I do not plan to stop. For fun, I enjoy long walks on the beach, stuffing my face with food, and lying in bed for an entire day.

I am extremely blessed to have Dr. Kerby Oberg as my mentor. With his patience and guidance, I have gained an experience like no other. This summer program has given me insight into the science/medical field, and it has only made me more determined to achieve my goals. Now, I can proudly brag to my friends that I can successfully feed cells.

MEASURING THE CELLULAR RESPONSE OF MACROPHAGES TO SOIL COMPONENTS BY FLOW CYTOMETRY: DETERMINING THE TOXICITY OF PODOCONIOSIS-ASSOCIATED SOILS

Andy Nguyen, Jamey Cooper, Nathan Lee, Kerby Oberg, Kevin Nick

Center for Health Disparities and Molecular Medicine, Department of Pathology and Human Anatomy, School of Medicine, Loma Linda University, Loma Linda, CA

Certain minerals are known to be harmful to human cells. Silica and asbestos affect the lungs and can cause cancer. A lesser known disease called Podoconiosis affects a large population in Ethiopia. Podoconiosis is characterized by lymphedema of the feet and legs. It has been suggested that silica particles in soils may enter the lymphatic system through the feet causing immune-related obstruction. Although silica has been suggested, no specific mineral or mineral properties have been confirmed, and no rationale for why such a common mineral should be so virulent in these particular locations has been deduced. Research has also suggested a genetic component to the disease. Our investigation employed two approaches. The first aim focused on comparing soil mineralogy, texture and composition from Podoconiosis-associated regions to unaffected regions. The high clay content of soils in diseased regions has often been referenced as its small size would allow it to easily enter the lymphatic system. The second aim focused on developing flow cytometry to quantify the immune response of macrophage cells to various minerals and soil particles. Our protocol confirmed previous reports that silica (5 mm) is toxic to macrophages (MH-S; CRL-2019) after 24 hours of exposure with an LD50 of ~ 2 particles/cell while latex beads (4.5 mm) showed little effect on the cells even at high doses (33 particles/cell). Podoconiosis-associated soils show a toxicity that appears similar to silica. Using weight/volume (mg/mL) rather than particles/cell, the toxicity (LD50) for Podoconiosis-associated and unassociated soils are being compared to silica, kaolinite, and latex beads to determine relative soil toxicity. Further flow studies are planned to evaluate macrophage activation and fibrogenic ligand production.

SABRINA RAINSBURY

ABC PARTICIPANT 2016

Over the course of my high school career, I have developed a deep-rooted passion for both medical science and humanitarianism. While my yearning to serve others has been fulfilled through my leadership of the Youth Service America and American Red Cross volunteer organizations, my love for medical science has manifested itself in AP science classes and two consecutive summers in this program. After graduating as a part of Eleanor Roosevelt High School's Class of 2017, I plan to attend a four-year university to major in neuroscience before applying to medical school.

I am grateful to have been a part of the FigNeuro lab for a second summer. The lab's primary aim is to investigate the relationship between diet and susceptibility to post-traumatic stress disorder (PTSD). Working in a neuroscience lab has fortified my lifelong ambition of becoming a neurologist and has imparted critical knowledge about the current demands of the medical field.

Last summer, my research experience facilitated the development of new techniques. While this summer further progressed my skill development, my experience has extended beyond lab work into invaluable lessons that will resonate into my future. I thank Julio David Vega and Ivana Alicea-Polanco for serving simultaneously as teachers and admirable model students. I especially thank Dr. Priya Kaylan-Masih for continually providing important college and life advice and my mentor, Dr. Johnny Figueroa for readily simplifying complicated neuroscience.

EARLY-LIFE OBESITY INCREASES SUSCEPTIBILITY TO POSTTRAUMATIC STRESS AND DISRUPTS HIPPOCAMPAL STRUCTURE

Sabrina Rainsbury-Silva, Priya Kalyan-Masih, Julio Vega-Torres, Christina Miles, Elizabeth Haddad, Mohsen Bagchechi, Andre Obenaus, Johnny Figueroa

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

Early-life traumatic stress and obesity frequently co-occur and have been identified as major risk factors for psychiatric disorders. However, studies examining how obesity disrupts the ability of the brain to cope with traumatic stress are lacking. The aim of this study was to determine whether a Western-like high-fat diet (WD) increases susceptibility to posttraumatic stress. Adolescent Lewis rats (postnatal day, PND, 28) were fed *ad libitum* for eight weeks with either an experimental WD diet (41.4% kcal from fat) or a control diet (16.5 % kcal from fat). We conducted posttraumatic stress behavioral tests at one week following exposure to a predator odor threat. One week after traumatic stress, the elevated plus maze and the open field test revealed increased anxiety-like behaviors in the rats consuming the WD when compared to control animals ($p < 0.05$). Magnetic resonance imaging showed a significant 20% decrease in the total hippocampal volume of animals fed the WD when compared to controls. The reduced hippocampus size was associated with increased anxiety-like behaviors and FKBP51 protein levels. Immunohistochemical analyses showed reduced blood vessel count in the hippocampus of animals that consumed the WD. We found asymmetric structural vulnerabilities to the WD, particularly the ventral and left hippocampus. This study highlights how WD consumption during early life impacts key substrates implicated in posttraumatic stress disorder (PTSD). Understanding how nutrition affects the developmental trajectories of the stress neurocircuitry is critical as stress susceptibility imposes a marked vulnerability to neuropsychiatric disorders.

JOSHUA RAMIREZ

ABC PARTICIPANT 2016

It has been said, "You have but one life that will soon be past; only what's done for Christ will last." For over six years, I have been given the honor of tutoring children K-3 who come from low-income and abused homes in San Bernardino, CA. These children also live only three miles away from the recent Islamic terrorist shootings. At our center, I find engaging ways to help them learn common core subjects in math and science while helping them conquer their fears through believing in God's power. This small center provides a great dose of spiritual and mental health.

I love playing the piano and volunteer at Loma Linda Children's and Adult hospitals. I see cancer patients and distressed families unsure how to deal with a loved one in the hospital. However, as soon as I play classical and worship songs, I see many worries and mixed emotions fade away. These life experiences are preparing me to one day combine a healing environment with medicine.

My career goal is to become a pediatric neurosurgeon specializing in disease prevention and volunteer my services to less fortunate children domestically and in third world countries. Thus, academically I have been attending Mt. San Jacinto Community College since age 13 and have completed 60 college units.

The climax of my entire year has undoubtedly been the privilege to research in Dr. Carlos Casiano's lab under the guidance of Christina Du Ross and Leanne Burnham. The ABC program has allowed me to study the intricacies of cancer cells, including the detailed connection of co-targeting multiple survival pathways to resensitize chemoresistant prostate cancer cells to taxanes. Our goal is to one-day cure cancer which aligns with Loma Linda's goal to make man whole in Jesus' name.

TAXANE-SENSITIVE AND -RESISTANT PROSTATE CANCER CELLS EXHIBIT DIFFERENCES IN THEIR MIGRATION POTENTIAL AND TRANSCRIPTOME PROFILE

Joshua Ramirez, Christina Cajigas-Du Ross, Charles Wang, Xin Chen, Carlos Casiano

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

Prostate cancer (PCa) is the most commonly diagnosed cancer in American men and the second leading cause of male cancer deaths. PCa patients undergoing treatment often develop metastasis and castration-resistant prostate cancer (mCRPC). Our group has shown that expression of lens epithelium-derived growth factor protein of 75 kD (LEDGF/p75) is elevated in PCa cells and tissues. LEDGF/p75 is a stress transcription co-activator that protects PCa cells against death induced by chemotherapeutic agents such as the taxane drug Docetaxel (DTX). DTX is the current standard of care for patients with mCRPC; unfortunately, disease progression and chemoresistance occurs in DTX-treated patients. DTX resistance is characteristic of metastatic tumors, leading to high patient mortality. We have shown previously that targeting LEDGF/75 with small molecule inhibitors or siRNA-mediated knockdown partially re-sensitized taxane resistant PCa cells to DTX treatment. Our group and others have also established a role for LEDGF/p75 in promoting increased cancer cell proliferation and clonogenicity, leading to enhanced cell survival. In this study, we aimed to examine the migration potential of taxane-sensitive (low LEDGF/p75 expression) and –resistant (high LEDGF/p75 expression) PCa cells using an *in vitro* wound-healing assay. Taxane-resistant PCa cells showed decreased migration compared to taxane-sensitive cells. However, the opposite effect was observed in taxane-resistant cells after LEDGF/p75 knockdown, suggesting this protein may influence cell migration. In order to gain insights into molecular mechanisms underlying taxane resistance in these cells, we performed RNA-sequencing comparing transcriptome profiles in taxane-sensitive and –resistant PCa cells. Preliminary Ingenuity Pathway Analysis (IPA) of RNA sequencing data identified downregulated genes associated with cellular movement and migration in taxane-resistant PCa cells, consistent with results observed in the migration studies. Taken together, these results suggest differences in gene expression between taxane-sensitive and –resistant PCa cells may influence the migration and metastatic potential of these cells.

RAQUEL RODRIGUEZ

ABC PARTICIPANT 2016

From a very young age, I discovered my passion to learn. As a 3-year-old, my mother would tell me I would put on my backpack and tell her to take me to school, and I would complain all morning because she didn't. That day finally arrived, and I'm now a graduate from Arroyo Valley High School in San Bernardino, CA. I will be attending California State San Bernardino and majoring in biology this fall. I plan to be a clinical laboratory scientist. I'm aware my journey will be long, but I'm confident that with God and my dedication, I will go far and reach my goal.

I learned very important aspects about myself during high school from acquiring a new skill that soon became one of my favorite hobbies. I decided to take an art course because I already had a small amount of drawing skills collected over the years. In that class, I learned how to paint and draw realistically and how to draw human faces. It was a great experience; I was shocked how much my skills advanced in that small time period. Now if I haven't drawn anything in the day, I have a thought in the back of my mind saying "You need to draw!"

I have been placed in the breast cancer lab of Dr. Daisy De Leon under the mentorship of Qianwei Tan, with the help of Vinodh Kumar Radhakrishman, and PhD/MD student Xousaen Helu. I really appreciate all the time and effort they have put in me and also their great amount of patience. They have to make sure I have learned everything correctly. I was amazed that in the first weeks I could learn so many new terms and techniques.

IGF-II REGULATES MITOCHONDRIA OF BREAST CANCER CELLS TREATED WITH DOXORUBICIN

Raquel Rodriguez, Quiawei Tan, Xousaen Helu, Vinodh Radhakrishman, Daisy De León

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

Ethnic differences contribute to the aggressiveness and breast cancer survival among African-American (AA) women compared to Caucasian (CA) women. Insulin-like factor II (IGF-II) plays a significant role in fetal development, cell proliferation, cell differentiation, and survival. Our laboratory demonstrated IGF-II regulates mitochondrial DNA and nuclear and mitochondrial genes important in cell death. Cell death is executed by the mitochondria when its contents are released into the cytoplasm as a response to cellular insult. We demonstrated IGF-II levels protect the mitochondria against Resveratrol (RSV) treatment. RSV is a chemical found in grapes associated with a decrease in breast cancer incidence. In breast cancer cells, RSV inhibits IGF-II and stimulates cell death. However, if IGF-II is added with RSV, there is no cell death. Thus, IGF-II protects the mitochondria, inhibits apoptosis, and may promote chemoresistance. We propose that IGF-II promotes chemoresistance by protecting the mitochondria. In this study, we examine the effect of doxorubicin and cisplatin treatment in the mitochondria of TNBC cells. The CRL 2335 cell line was chosen because these TNBC cells produce high levels of IGF-II. We will determine if doxorubicin and cisplatin treatment affects IGF-II. Since RSV inhibits IGF-II, we will co-incubate doxorubicin and cisplatin with RSV to determine if RSV reduces IGF-II and sensitizes the cells to doxorubicin and cisplatin. IGF-II analysis was performed by SDS-PAGE and Western blotting. Confocal microscopy was used to assess mitochondrial phenotype. Our results show IGF-II levels increased when cells were treated with doxorubicin and cisplatin. In contrast, resveratrol inhibited IGF-II. Confocal microscopy using the JC1 stain revealed remarkable mitochondrial changes when cells were treated with doxorubicin, cisplatin, and Resveratrol. Furthermore, IGF-II treatment also changed mitochondrial phenotype and reverted the effect of chemotherapy. Our results revealed how IGF-II expression altered the mitochondrial phenotype and prevented the effectiveness of common chemotherapy such as doxorubicin and cisplatin.

KIMBERLY FRANCO SALAZAR

ABC PARTICIPANT 2016

"Once you were a child. Once you knew what inquiry was for. There was a time when you asked questions because you wanted answers, and were glad when you had found them. Become a child again, even now…." These words penned by C.S. Lewis encompass a key part of who I am. A few minutes with a toddler will inevitably result in the awakening of the unanswerable "why." As this same toddler grows, this "why" is left behind.

I am holding on to my unanswerable "why." The constant questioning that takes place in my brain is one that has been guiding me through my schooling. I attended Etiwanda High School in Fontana, and I'll be graduating from Rouse High School in Texas. I plan on majoring in chemical engineering.

ABC has given me the incredible opportunity to keep asking questions. I'm currently in Dr. Nathan Wall's cancer research lab working alongside Janviere Kabagwira investigating the role of different survivin splice variants on the chemoresistance of pancreatic cancer cells. The lab has been extraordinarily kind, patient, and educational. A million thanks to Amber Gonda, Janviere Kabagwira, James McMullen, Ron Moyron, and Dr. Nathan Wall for their extraordinary guidance. This program has solidified my passion for research.

I also owe a tremendous amount to my parents. Their continuing emphasis on the importance of education and their amazing strength have shaped me into the person I am today. If not for them and my grandparents, I may not have chased the unanswerable "why." Most importantly, I am indebted more than I can even comprehend to my God. The utmost thanks go to Him.

ROLE OF DIFFERENTIAL EXPRESSION OF SPLICE VARIANTS IN CHEMORESISTANCE OF PANCREATIC CANCER LINES

Kimberly Salazar, Janviere Kabagwira, Lien Hardister, Nic Galloway, Heather Ferguson Bennit, James McMullen, Amber Gonda, Nathan Wall

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

Pancreatic cancer is one of the most deadly forms of cancer due to the high difficulty of detection. The gold standard treatment for pancreatic cancer is the chemotherapeutic agent gemcitabine. However, this treatment is not always effective due to the chemoresistance that cancerous cells develop. This chemoresistance seems to be tied with Survivin. Survivin is an oncofetal protein associated with the enhancement of the cell cycle as well as a member of the inhibitor of apoptosis protein (IAP) family. Survivin is characterized by its BIR domain, a series of 5 nucleotide sequence repeats which give Survivin its anti-apoptotic function. Currently, ten different splice variants of Survivin have been discovered. These splices are the result of alternate splicing of introns and exons of Survivin pre-mRNA. Those splices with a truncated BIR domain either have reduced anti-apoptotic function or pro-apoptotic function. Those with the full domain have anti-apoptotic function which aids in the chemoresistance of cancer cells. We experimented on two different pancreatic cancer cell lines: MIA Paca-2 and Panc1 cells. MIA Paca-2 are chemosensitive to gemcitabine while Panc1 are chemoresistant. Our main goal was to compare the expression of the splice variants of Survivin in these two cell lines in order to see if the expression of certain variants were specifically associated with chemoresistance. We ran time course analysis, traditional PCR, and flow cytometry. The results showed that all Survivin variants except ΔEX 3 were equally expressed in both while ΔEX 3 was absent in both. We observed that Phosphatidylserine membrane leaflet transition was observed after Gem treatment in both cell lines. In the future, we want to repeat block PCR of the Survivin splice variants in the presence of Gem. We also plan on running Annexin flow cytometry analysis using PI alone.

KIMBERLY SIBRIAN

ABC PARTICIPANT 2016

I am a senior at Vista Del Lago High School. Along with being in various organizations such as UBMS, AVID and EAOP, I have also been a two-year girls' basketball varsity player. For the last three years "the game of basketball has been everything to me, my place of refuge, place I've always gone when I needed comfort and peace. It's been the site of intense pain and the most intense feelings of joy and satisfaction. It's a relationship that has evolved overtime," said the great Michael Jordan. As an athlete, the way you deal with different types of failure and rejection shapes the type of person you are. I was taught as a kid that "whatever doesn't kill you makes you stronger." That's been a trait that has stuck with me ever since, and I apply this idea to all activities.

In basketball, the first quarter is the most important one, showing your opponents what you're made of, whether you are going to put up a fight or let them take an easy win. My life is a basketball game. The first quarter is where I am currently. High school determines how I perform during the second and third quarters, college and medical school. The third quarter will determine if I pull out a win for the fourth quarter and become a neurosurgeon.

This year I had the honor to be part of the physiology lab with Dr. David Hessinger. I was extremely fortunate because I had not one but four mentors: Dr. Dan Morris, Dr. Glynne Thorington, Dr. Hessinger, and Alice Nam. They have really been a great source of inspiration and motivation. Working under their leadership has been the most fulfilling moments in my life.

CORTICOSTEROIDS CAUSE AN INCREASE IN THE EXPRESSION OF β IN BK CHANNELS

Kimberly Sibrian, Alice Nam, Glyne Thorington, Daniel Morris, David Hessinger

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

Pulmonary artery development in premature fetuses in preparation of lung breathing is critical. Glucocorticoids, such as celestone, are given to pregnant women when it is expected that the fetus will be premature and born with immature lungs. Celestone is used to accelerate lung maturation in premature fetuses. Pregnant ovines were injected at 122 days of gestation with celestone or saline. Two days later, mothers and fetuses were sacrificed to examine fetal pulmonary arteries (PAs) to determine the effects of celestone on lung maturation. We hypothesized that celestone would increase BK channel expression of both α and β subunits in premature (122 days) ovine fetuses. Bk channel expression was measured through gel electrophoresis and quantitative real-time PCR (qRT-PCR) . On the one hand, RT-PCR findings suggest only a minor increase in BKα transcript levels, thereby, not confirming our hypothesis. On the other hand, in non-reduced adult ovine samples, BKα and BKβ subunits appear to co-migrate. Polyacrylamide gel electrophoresis (PAGE) of near-term fetal and adult PAs suggests that BKα and BKβ subunit proteins are covalently linked by disulfide bridges under non-reduced conditions.

ALEXIS TOWNSEND

ABC PARTICIPANT 2016

I have known since first grade that I wanted to pursue a career in the medical field. I am a naturally curious person, and medicine has always been endlessly fascinating to me. When I was seven, my aunt, who lived with us at the time, was diagnosed with breast cancer. After her treatments, she would come home and tell me about the procedures done that day. Although she was in a lot of pain, the procedures helped to ease her suffering. Since that time, I have wanted to be a doctor because I wanted to help ease others' pain just as the doctors did for my aunt.

I will be starting my senior year at Loma Linda Academy where I have attended since kindergarten. Currently, I am trying to make the hardest decision of my life: where to go for college. Although I am not yet certain where I will go, I know I intend to be a bio-med major. I know that is a challenging major, but I am confident I will succeed because I am a driven individual and motivated to accomplish my goals.

This program was an amazing opportunity for me. Most people do not get the chance to do medical research until they are in college. In this program I learned to think critically as well as to write scientific matter. This summer I worked with a graduate student who is pursuing her MD/PhD named Mary Beth Yu in Dr. William Langridge's lab. Our project was to study carbamylated protein exposure on dendritic cells and their effect on rheumatoid arthritis to develop successful therapies in the future. Thank you, Mary Beth and Dr. Langridge, for mentoring me and helping me to feel like a real member of the team.

EFFECTS OF CARBAMYLATION ON HUMAN MONOCYTE-DERIVED DENDRITIC CELL VIABILITY

Alexis Townsend, Mary Beth Yu, William Langridge

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

Rheumatoid arthritis (RA), a systemic autoimmune disease, predominantly affects joints and can ultimately lead to permanent bone loss. Unfortunately, no cure for RA inflammation exists, only medications that decrease inflammation and slow disease progression. Smoking and periodontal infection are environmental risk factors for RA and are believed to increase carbamylation of self-proteins. Carbamylation is a non-enzymatic post-translational modification of self-proteins by addition of a carbamyl group to the amino acid residue lysine which may stimulate a pro-inflammatory immune response. The antibody response to carbamylation is specific to RA. Dendritic cells are a crucial component of the immune response because they take up antigens, present them to naive T cells, and guide their differentiation into effector T cells. However, effects of carbamylation on dendritic cell modulation of T cell differentiation remain unknown.

This project aims to determine the effects of carbamylated protein exposure on dendritic cell activation and modulation of naïve T cell development. Effects of carbamylation on dendritic cell viability were tested to determine carbamylation- generated cytotoxicity. Human monocyte-derived dendritic cells (moDC) were generated from peripheral blood monocytes isolated from healthy blood donors. Carbamylation was performed with potassium cyanate incubation, and verified through SDS-PAGE and a colorimetric assay. Carbamylated and native bovine serum albumin (BSA) and fetal bovine serum (FBS) proteins were introduced to the moDCs. After 48 hr incubation, cell viability was assayed by trypan blue exclusion and MTT assays. These methods indicated 0.06 mg/ml native or carbamylated BSA is not cytotoxic. In future experiments, dendritic cell activation will be assessed after incubation with non-toxic levels of carbamylated proteins. Data from these experiments will help to determine whether protein carbamylation can initiate RA through alteration of dendritic cell functions. Data gathered from these experiments will help us understand the mechanism of RA initiation and may lead to successful therapies for patients suffering from this progressive, debilitating, and painful autoimmune disease.

ASHLEY VAZQUEZ

ABC PARTICIPANT 2016

Alpacas, sheep, chickens, pigs. That was my first day attending The Grove School in Redlands. To graduate in a class of 30 and know each one of us were off to a different place was the most nerve wrecking feeling. How can one adjust from a school of 100 to a university of 50,000? This idea crossed my mind constantly for *the whole four days* I had between graduating and starting the ABC program. After that, I was busy analyzing data traces day after day. This process took a lot to get used to and preoccupied hours trying to master the art of "lab charts." Loma Linda University's kind and accepting environment allowed me to view the transition as just another step towards success rather than a whole new world I had to learn. The patient and smiling faces guided me to success in the tasks I was assigned, and without realizing it, I had found my new "Grove."

In fall of 2016 I will be attending UCR as a biochemistry major. To be a leader and successfully aid those around me have always motivated me to continue with my education and reach my goal to become involved in the medical field. My ambition to become either a pediatrician or a medical researcher revolves around my passion to further improve the health and lives of everyone and give back to my community.

With the guidance of my mentors, Dr. Sean Wilson, Craig Wolfe, and Carla Blum-Johnston, I was able to fully understand our research and develop my career interest as a biomedical researcher. As I move on in my scientific career, I will always look back at this opportunity as my first step towards my future.

INTRAUTERINE CHRONIC HYPOXIA AND BETA ADRENERGIC PULMONARY ARTERIAL VASODILATION IN FETAL SHEEP

Ashley Vazquez, Brandon Painter, Raveena Jalota, Quinton Blood, Lawrence Longo, Sean Wilson

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

Intrauterine chronic hypoxia is the lack of oxygenation in primary tissues of the fetus and is often due to high altitude exposure. This condition can cause many developmental abnormalities including dysfunctional vasoreactivity of the pulmonary arteries, which ultimately contributes to pulmonary hypertension of the newborn (PPHN). This disease can lead to further complications into adulthood. While the role of beta adrenergic signaling is well described for airway smooth muscle and is a major focus for treatment of asthma, far less is known about its role in pulmonary arterial function. Even still, previous evidence illustrates that beta adrenergic signaling pathways hold promise for the treatment of PPHN. We hypothesized that beta adrenergic mediated vasodilation may be preserved following chronic hypoxia and provide a novel therapeutic avenue for afflicted newborns. We isolated pulmonary arteries from fetal sheep gestated at 3,801 m for 110+ days. We performed myography to measure the isometric tension in pulmonary arteries and to study vasorelaxation due to the beta-agonist isoproterenol and the methylxanthine phosphodiesterase inhibitor, IBMX. Our data show isoproterenol-mediated relaxation was preserved following chronic hypoxia. However, chronic hypoxia impaired IBMX-mediated vasorelaxation through the L-type Ca channels. Overall, these studies provide evidence beta adrenergic pathways are therapeutically relevant, and there are changes in cell signaling that likely contribute to the development of the disease.

CRISTIAN VERA-TORRES

ABC PARTICIPANT 2016

Socrates once said, "To know, is to know that you know nothing. That is the meaning of true knowledge." Personally, this mindset has enhanced my desire for knowledge. I graduated from Bloomington High School and will attend UC San Diego this fall majoring in biochemistry. My ultimate goal is to attend medical school to become a pediatrician. Where I'm at now marks the beginning of my journey through higher education. However, I'm not afraid of the unknown. I'm up for the challenge, and I will tackle it head on.

When not doing school work or playing sports, I enjoy doing community service especially through the National Honor Society. The feeling of selflessness and satisfaction helping my community has given me the inspiration to pursue my dream of becoming a pediatrician. I want to work in a field that holds these same promises of satisfaction for helping those in need. I may not be able to make a difference for the whole world, but I know I will surely make a difference for some child every single day.

Prior to the ABC program, I had no idea what a research laboratory was like. However, my whole perspective on research changed after the program. Science was no longer mixing a few chemicals and miraculously creating a superhuman serum. No, it is more than that. It is constant questioning in order to gather new knowledge. It is constant attentiveness as any minute mistake could cause drastic effects in our experiment. I am thankful that I was a part of Dr. Marino De León's laboratory this summer under the guidance of Perla Ontiveros Angel. Before the program, I couldn't even handle a single pipette. Now I can proudly say I'm in the process of mastering flow cytometry.

FLOW CYTOMETRIC DETECTION OF AUTOPHAGIC MARKER LC3-B IN PC12 CELLS TREATED WITH PALMITIC ACID AND DOCOSAHEXAENOIC ACID

Cristian Vera-Torres, Perla Ontiveros Ángel, Jo-Wen Liu,
Manuel Montero, Marino De León

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

Flow cytometry is a technique which allows for the measurement of multiparametric conditions such as cell size, granularity, and protein/gene expression of individual cells in heterogeneous populations. This laser based, biophysical technology uses optical andfluorescent signals in order to target specific biomarkers in cells of interest. Flow cytometry is used in our study to research the effect of lipotoxicity in nerve growth factor (NGF) differentiated pheochromocytoma cells derived from rat adrenal medulla (PC12) treated with palmitic acid (PA) and docosahexaenoic acid (DHA). Previous publications from our laboratory have shown that DHA, a polyunsaturated fatty acid, and PA, a saturated fatty acid, have direct involvement in the processes of lipotoxicity and autophagy. Further understanding of the dynamics and complexities of cell survival is crucial in order to treat a variety of health disparities. Thus, this investigation approached PA induced lipotoxicity in PC12 cells and the effect that DHA has in their ability to activate pathways for autophagic cell survival. Cells were labeled with an antibody against LC3-B which is known to play a critical role in autophagy as it is known to be recruited during autophagosomal formation. PC12 cells were treated with bovine serum albumin (BSA) as control, DHA, PA, and chloroquine. Our data indicates that cells treated with DHA exhibit a greater increase in levels of LC3-B protein expression at 12 hours suggesting that these cells have activated pathways of autophagy and cell survival. Additionally viability and cell size measurements confirm that DHA equips the cells to perhaps sustain structure of the autophagosomes and increase survival compared with the control BSA, PA and chloroquine.

NANCY ZELAYA

ABC PARTICIPANT 2016

I graduated as valedictorian from the high school ranked number 9 in California, Middle College High School. I not only graduated high school, but I graduated college, obtaining my Associate of Arts degree with an emphasis in biological and physical sciences. I also obtained my intersegmental general education transfer curriculum certificate from San Bernardino Valley College all at the age of 18.

I will be attending University of California, Riverside, in the fall where I will major in neuroscience. My ultimate academic goal is to obtain my doctor of medicine degree. I grew up surrounded by the average unhealthy American lifestyle, but I strive to live a fit and healthy one. I am very educated and informed about fitness and nutrition. I understand the need for health professionals to focus on these areas as health problems related to weight and diet continue to increase in our country. I want to help and educate the public. Bariatrics is my passion. Being a bariatric physician is what I was born to do, and I will do everything it takes to reach my dream.

I am working in Dr. Nipher Malika's applied research lab in the School of Public Health. My research project involves surveying and analyzing the students who participated in the 2016 Gateway to the Health Professions and determining the correlations between their health, lifestyle, and academic performance. This research project will expose me to a new experience and a new field where I will discover new findings while making a difference. I am very excited to be part of this project, and I am thankful to have the correct guidance and support system here at Loma Linda University.

MEASURING GRIT, HOPE, AND OTHER CHARACTERISTICS OF SUCCESSFUL PIPELINE STUDENTS

Nancy Zelaya, Nipher Malika, Tina Pruna, Juan Carlos Belliard

Center for Health Disparities and Molecular Medicine, School of Medicine, School of Public Health, The Institute of Community Partnerships, Loma Linda University, Loma Linda, CA

The importance of educational pipeline programs in addressing the shortage of underrepresented minorities in the health professions is well established, but less is known about what types of students successfully complete such pipeline programs and pursue the health professions. It has been shown that the achievement of difficult goals entails not only talent but also support, hope and the sustained and focused application of talent over time. The aim of this study was to assess if students in a health career pipeline program contain key characteristics important for future success. A convenience sample of students (n=58) participating in the Summer Gateway to the Health Professions program at Loma Linda University completed a 47-question survey. This cross-sectional survey assessed four domains: hope, grit, future vision, and knowledge gained from the program. Students' t-test, logistic, and generalized linear regressions were used to assess the models for this study. The results revealed that student participants have high hope and are grittier in comparison to national statistics. It was also statistically evident that the high rate of mentorship by adults among these students significantly influenced their GPA, hope, community service, and initiative to pursue higher education. The results of this study help us think about how to best nurture these valuable traits and support the development of underrepresented minorities to pursue and succeed in the health professions.

Undergraduate Training Program (UTP)

Jared Abraham Rodríguez
Kwame Amponsah
Renissa Arnold
Samuel Bagley II
Carla Blum-Johnston
Rebecca Hernandez
Pablo Huerfano
Mariah Jackson
Dustin James
Danielle Little
Quincy Monroe
Angela Morales
Eunice Nyasani
Anna Gifty Opoku-Agyeman
Evelyn Sanchez
Claire Stewart
Erwin Stuffle
Anna White

JARED ABRAHAM RODRIGUEZ

UTP PARTICIPANT 2016

I am a senior biology mayor at Antillean Adventist University in Mayaguez, Puerto Rico. In three years of college, I have been receiving achievements from my program and from the university. In my senior and last year of college, I was named the president of the Pre Med and Biology Club. At my college I have done community and volunteer service in the weeks of prayers. The community and volunteer service experience helped me to understand more how I can help other people that have problems in their lives to get better lives.

In my future, I have very good plans and very good expectations for my life. When I was very young, I wanted to be a doctor to help many people to have good health. Over the years, I have found a love towards science and medicine, and this love is the reason I want to achieve the MD/PhD degree in the future.

This is my first time doing research because last summer I was doing an internship in medicine in Puerto Rico. Now I am doing research with Dr. Carlos Casiano at Loma Linda University, and I accept the decision to do more research in my life until I get the MD/PhD degree. The most interesting part of my research has been working with the Western Blot experiment to see and read the proteins I am working on and studying. I also see the statistics of prostate cancer in African/American and European/American men. In this research program I have learned how to prevent prostate cancer.

This is a beautiful area of research, and I have to thank Tino Sanchez and Dr. Casiano for helping, teaching, guiding and trusting me to do good research and good work.

AUTOANTIBODY CO-TARGETING OF HUMAN ENDOGENOUS RETROVIRAL ENV AND GAG PROTEINS IN PROSTATE CANCER

Jared Abraham Rodríguez[1], Tino Sanchez[1], Sisi Bu[1], Jonathan Wooten[1], Christopher Montgomery[1], Feng Wang-Johanning[2], Stefan Ambs[3], Carlos Casiano[1]

[1]Center for Health Disparities and Molecular Medicine, Loma Linda University, Loma Linda CA; [2]Center for Cancer and Metabolism, SRI Biosciences Division, Menlo Park, CA; [3]Laboratory of Human Carcinogenesis, National Cancer Institute, NIH, Bethesda, MD

Human endogenous retrovirus (HERV) encodes about 8% of the human genome. HERV may play an important role in autoimmunity and cancer, but its mechanistic function in these diseases has not been clearly established. Normally, HERV expression in prostate epithelial cells is suppressed by DNA methylation; however, during chronic inflammation and in early stage prostate cancer (PCa), global DNA hypomethylation turns on these latent HERV genes. Recent studies reported that HERV-ENV and -GAG mRNA and protein expression are upregulated in PCa. Also, HERV-ENV protein expression has been found in 61% of PCa tumors from African American (AA) men compared to 40% of tumors from European American (EA) men. Given that AA men are more likely to be diagnosed with aggressive PCa and twice as likely to die from the disease as EA men, it is important to identify biological determinants contributing to these differences. A recent study reported that 7% of PCa patients produced autoantibodies to the HERV-GAG protein with the majority of these patients having late stage PCa tumors. Our group previously identified the presence of autoantibodies to HERV-ENV in sera from PCa patients, but we neither observed any preference for these antibodies in men with PCa versus non-PCa nor any preference based on ethnicity. In this study, we asked if men that produced antibodies to HERV-ENV also produced anti-GAG autoantibodies. Using Western blotting, we probed purified recombinant GAG with sera of AA and EA men with and without PCa and identified sera that had autoantibodies to both HERV-ENV and -GAG. These studies will determine if autoantibodies to HERV-ENV and -GAG appear at different frequencies in AA men compared to EA men and whether their detection could help improve early PCa diagnosis.

KWAME AMPONSAH

UTP PARTICIPANT 2016

The name Kwame, given to me by my Ghanaian father and Malawian mother, represents a male child born on Saturday in the country of Ghana. My parents have constantly influenced and supported me in my Seventh-day Adventist faith as well as my aspirations for greatness through education. Thanks to my great mentors in Leanne Burnham and Dr. Carlos Casiano in the lab, my eyes have been opened to health disparities in the United States, specifically the inequity in prostate cancer between African-Americans and Caucasians. My mentors have shown me the importance of helping the community and genuinely showing compassion towards others, especially seeing all the various causes of this crucial health disparity.

I graduated from Redlands High School in 2015 and I am currently a sophomore at Oakwood University in Huntsville, AL. I plan to join clubs, be active in creating new friendships, pursue musical interests, and take full advantage of my time at Oakwood University., and, if accepted, I plan to join the Loma Linda University School of Medicine in 2019.

I am excited and ready to take on the new challenges and adventures that Oakwood University has in store for me, and I know God's plan for me will come into fruition as I follow his path. As Zig Ziglar once said, "Your attitude, not your aptitude, will determine your altitude."

GLUCOCORTICOID-MEDIATED UPREGULATION OF STRESS ONCOPROTEIN LEDGF/p75: IMPLICATIONS FOR PROSTATE CANCER HEALTH DISPARITIES

Kwame Amponsah, Evelyn Sanchez, Leanne Woods-Burnham, Christina Cajigas-Du Ross, Arthur Love, Anamika Basu, Susanne Montgomery, Colwick Wilson, Carlos Casiano

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

The role of glucocorticoid receptor (GR) signaling in prostate cancer (PCa) progression is under intense investigation. While palliative therapy with synthetic glucocorticoids is administered to PCa patients undergoing androgen deprivation treatment or chemotherapy, increased GR expression in these patients correlates with worse prognosis. In addition, patients with aggressive PCa have higher serum levels of endogenous glucocorticoid (cortisol) than patients with early stage PCa. The emerging role of glucocorticoid-driven PCa aggressiveness is especially problematic for African American (AA) men, as previous studies have demonstrated chronically elevated serum cortisol levels and increased PCa aggressiveness in AA men compared to European American (EA) men. However, the molecular mechanisms underlying GR-mediated PCa aggressiveness are not clearly understood. We hypothesize that GR signaling in PCa cells may activate stress pathways underlying chemotherapy resistance and may disproportionately operate in AA men. We evaluated the effects of GR activation on the expression of the stress oncoprotein LEDGF/p75, implicated in chemotherapy resistance in PCa cells. We exposed a racially diverse panel of PCa cell lines (MDA-PCa-2b, 22Rv1, PC3, and DU145) to physiological concentrations of cortisol or dexamethasone (synthetic glucocorticoid) for up to 48 hrs and observed by Western blotting the upregulation of GR and LEDGF/p75 in treated cells. Results were quantified using Image Studio™ and t-test statistical analysis. Co-treatment of cells with GR antagonist mifepristone attenuated glucocorticoid-induced LEDGF/p75. In addition, silencing of LEDGF/p75 in PC3 cells decreased GR expression, suggesting a functional interplay between these two proteins. Furthermore, we quantified by ELISA the serum levels of LEDGF/p75 in PCa patients and observed higher levels in AA PCa patients compared to EA patients and controls. These studies represent a first step in elucidating the contribution of GR signaling to activation of the LEDGF/p75 chemotherapy resistance pathway in PCa, particularly in the context of PCa racial disparities.

RENISSA ARNOLD

UTP PARTICIPANT 2016

Maya Angelou once said, "My life is not merely to survive, but to thrive; to do so with some passion, compassion, some humor, and some style." This quote encompasses the standard by which I try to live my life. Many know me for my optimistic and straightforward demeanor. Yet, my positive and outgoing demeanor is just one facet of who I am. I am an African-American woman, non-profit co-founder, and, most importantly, a child of God.

"Critically thinking around the wheel" is a phrase that I also live by. As a researcher, this perspective is invaluable. I am a senior psychology major at Oakwood University with aspirations to obtain my PhD in counseling psychology, emphasizing children in underrepresented backgrounds. My experience as a mentor for underclassman psychology students at Oakwood University has taught me how to guide others in achieving goals. Throughout my matriculation, I have discovered the practice of psychology no longer relies solely on Freudian theories and behavioral principles. It has evolved and adapted, and psychologists must adapt. As an aspiring psychologist, I fully realize that to effectively treat people, I must have an appreciation for both the people I help and the biological mechanisms that drive behaviors.

This summer I had the privilege of working in Dr. Andre Obenaus' lab. We studied the differences in male and female mice behavior in response to traumatic brain injuries. I am grateful for all of the exceptional researchers within this lab, especially the supervision and encouragement given from my lab coordinator Mary Hamer. As a future researcher and alumnus of Oakwood University, the motto *Enter to Learn. Depart to Serve* still holds true. The research process is the perfect way to make effective change.

ASSESSMENT OF GAIT ANALYSIS DIFFERENCES BETWEEN GENDERS FOLLOWING TRAUMATIC BRAIN INJURY IN MICE

Renissa Arnold, Rebecca Hernandez, Bethann Affeldt, Arjang Salehi, Mary Hamer, Sonali Bhakta, Angela Avitua, Elizabeth Haddad, Saburi Eliamani, Andre Obenaus, Amandine Jullienne

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

Traumatic brain injury (TBI) is a life altering health condition that affects individuals globally each year. Recent clinical studies have shown differences between male and female patients in recovery time and overall outcomes following TBI. Prior experimental studies have focused on the effects of TBI in adult rodent models, but few have investigated the differences between males and females. We hypothesized there would be significant behavioral differences between males and females in response to TBI. TBI was induced in male and female mice using a controlled cortical impact (CCI) that mimics a moderate TBI. The cortical surface is directly impacted to the right side of the brain after a craniotomy to a depth of 1.5 mm. Gait was evaluated before (baseline) and after CCI at 1 day and 8-day post injury (DPI). The Noldus Catwalk XT 10.5 Gait Analysis software, an automated gait analysis device, was used to assess gait abnormalities. We analyzed the base of support and print area parameters. The base of support parameter evaluates the distance between two hind paws or two front paws. The print area parameter represents the complete print of the four paws. We found no significant differences in base of support or print area between groups and between time points for each group. However, we observed a trend towards a greater increase in print areas in females compared to males at 1DPI. The increase of the front paws' distance in females is consistent with clinical studies where the base of support is increased in patients after brain injury. We conclude that females have increased gait abnormalities at 1DPI than males. Further analysis is needed to show potential significant differences between males and females after TBI in mice.

SAMUEL BAGLEY II

UTP PARTICIPANT 2016

Growing up in Atlanta, GA, my parents instilled in me a passion for growth in all things. At Atlanta Adventist Academy, I was a two-term student body president, which allowed me to grow leadership and communication skills. Also during high-school, I was able to go on mission trips to Kenya, Nicaragua, and Guatemala, through which I learned how crucial it is to serve your fellow man. Upon graduating, I received the National Achievement scholarship and a full ride to college, which has allowed me to focus on my studies rather than my funds. These things, along with other facets of growth, are what led me to my current career aspirations to acquire my MD/PhD and pursue a career in research in tandem with a career as an emergency room physician.

As a junior and biomedical sciences major at Oakwood University, I have taken part in research for most of my undergraduate career through the Alabama Louisa Stokes Alliance for Minority Participation (ALSAMP) program, an NIH-funded initiative that incorporates minority students into research during their undergraduate years. Under the mentorship of Dr. Elaine Vanterpool, who received her PhD in Microbiology from Loma Linda University, I have been working on the gram negative bacterium *Porphyromonas gingivalis,* which plays a crucial role in the propagation of gingivitis.

Now, for the second summer in a row, I've had the opportunity to continue this work in the lab of Dr. Hansel Fletcher, who runs the same lab my mentor, Dr. Vanterpool, did her doctoral work in. Under the direction of Dr.'s Aruni and Dou, I've been able to help further the lab's research on the Sialidase protein, which has been implicated in supporting the virulence of *Porphyromonas gingivalis*.

PORPHYROMONAS GINGIVALIS SIALDASE VIRULENCE MODULATION UNDER ENVIRONMENTAL STRESS CONDITIONS

Samuel Bagley, Dou Yuetan, Aruni Wilson, Elaine Vanterpool, Hansel Fletcher

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

Porphyromonas gingivalis's sialidase protein has been shown to be involved in the post-translational modification of genes implicated in the virulence of the bacteria. Earlier studies showed that the sialidase protein is classified as a glycohydrolase and as an exonuclease. Sialidase aids *Porphyromonas gingivalis* in pathogenesis by evading host immune responses by stimulating chemokine release, adherence, biofilm formation, and nutrient absorption. Previous studies have yet to determine the role of sialidases in the regulation of *Porphyromonas gingivalis's* response to heat and oxidative stresses, which are crucial to understanding its involvement in the bacteria's virulence. To better understand its role when exposed to these environmental factors, a *PG0352* (Sialidase) mutant was generated using overlapping extension PCR. *In vitro* growth studies showed that the *PG0352* mutant did not show significant differences at 42 and 55-degree stress compared to W83, but it did show significant sensitivity to hydrogen peroxide stress compared to W83. The protein profile of W83 and the *PG0352* at 37 and 55 degrees showed the activity of the gingipains Rgp and Kgp to be significantly decreased in the *PG0352* mutant compared to W83. Expression of chaperone genes was analyzed via RT-PCR and showed that the genes *grpE, dnaK, groES* and *dnaJ* were all downregulated at least two-fold in *PG0352* at 55 degrees in comparison to the wild type. Also, *PG0352* was downregulated ten-fold in comparison to W83 at 55 degrees compared to 37 degrees. From this data, it can be extrapolated that *PG0352* plays a significant role in the survival and virulence of *Porphyromonas gingivalis.*

CARLA BLUM-JOHNSTON

UTP PARTICIPANT 2016

I have always loved learning, but the summer of 2012 changed my life when I participated in the ABC Program and started to realize the true complexity and beauty of the human body, the astounding number of questions we still have about it, and my excitement at the prospect of being able to help answer even one of those questions. The program challenged me, taught me how to learn, and showed me what I am capable of accomplishing. I am very grateful to be back for a fourth summer.

I attend Walla Walla University and just returned from Blantyre, Malawi, where I spent the school year homeschooling missionaries' children as part of our student missions program. This fall, I will return to WWU to continue studying theology with minors in biology and chemistry and working for Campus Ministries as the Music Ministries Chaplain. While God may lead elsewhere, I hope to enroll in LLU's MD/PhD program after graduation. I am studying theology because I want to be a physician who sees my patients as walking miracles—the integration of body, mind, and spirit—and a researcher who sees my investigation the way Francis Collins saw his work on the Human Genome Project, calling his discoveries "an act of worship." I believe a posture of service must accompany this form of worship, for even Christ "came not to be served but to serve…" (Matt. 20:28). Whether service takes me back across the Atlantic to Malawi, across the freeway to San Bernardino, or to places still unimagined, I am excited to see what God has in store.

I want to thank Dr. Sean Wilson's lab for welcoming me back this summer, teaching me patiently, and providing me with this incredible opportunity to learn and challenge myself.

CHRONIC HYPOXIA UNCOUPLES CA2+ AND ENOS IN BRADYKININ-INDUCED RELAXATION OF OVINE PULMONARY ARTERIES

Carla Blum-Johnston, Monica Romero, Chelsea Wee, Quintin Blood, Rachael Wilson, Arlin Blood, Lawrence Longo, Sean Wilson

Center for Perinatal Biology, Advanced Imaging and Microscopy Facility, Division of Pediatrics, Center for Health Disparities and Molecular Medicine, School of Medicine, Loma Linda University, Loma Linda, CA

Bradykinin-induced activation of the pulmonary endothelium triggers a rise in intracellular Ca^{2+}, which activates a nitric oxide (NO)-dependent signaling pathway. This pathway leads to vasodilation, thereby regulating pulmonary blood flow and 0_2 uptake. This vasodilation process includes stimulation of endothelial nitric oxide synthase (eNOS) and downstream activation of large-conductance K^+ (Maxi K^+) channels. Chronic hypoxia (CH) is known to increase pulmonary pressures and restrict arterial relaxation and can contribute to the development of pulmonary hypertension. We thus examined the effects of CH on bradykinin-induced Ca^{2+} signals, bradykinin-induced vasorelaxation, and the roles of eNOS and Maxi K^+ channels in this relaxation. Wire-myography and confocal microscopy studies were performed on pulmonary arteries (PA) from nonpregnant ewes that lived in a normoxic state at low altitude or a hypoxic state at high altitude (3,801 m) for >100 days. eNOS was inhibited with N^G-nitro-L-arginine methyl ester (LNAME), and Maxi K^+ channels were blocked with 1mM tetraethylammonium (TEA). The data show CH augmented endothelial Ca^{2+} signals but restricted bradykinin relaxation. Further, CH caused bradykinin-induced contraction. LNAME sensitivity was restricted, which suggests eNOS dysfunction is central to the uncoupling of Ca^{2+} signals and bradykinin relaxation. CH also abolished TEA-sensitivity in bradykinin relaxation, suggesting loss of Maxi K^+ function following CH. Overall, these results suggest that CH causes uncoupling of endothelial Ca^{2+} signaling and eNOS function and mediates major changes in the mechanisms of membrane hyperpolarization. It follows that CH-induced Ca^{2+}-eNOS uncoupling and Maxi K^+ channel dysfunction are important mechanisms to examine as future therapeutic avenues for pulmonary hypertension.

REBECCA HERNANDEZ

UTP PARTICIPANT 2016

Pursuing my education has always been the key to success. I was raised in a low income community where resources were scarce. Entering a university gave me an opportunity to help my community and develop my research career. I am a senior at California State University, Northridge, majoring in psychology and minoring in biology. I plan to pursue a PhD in the field of neuroscience because I have always found myself with a keen interest in the vital mechanisms of the brain.

I have the privilege to be part of the MARC program at my home institution which is geared to guiding students towards biomedical science research. Through this program I started working in a neurobiology lab with Dr. Randy Cohen where we work with the animal model of ataxia and traumatic brain injuries. I am fortunate enough to conduct research in a lab with my career interests, which also boosts my excitement for my future. Throughout my education I have joined Hermanas Unidas de CSUN, a powerful organization with the sole purpose to empower and create successful women of color. Being a part of this organization has furthered my desire to give back to my community.

This summer I have had the opportunity to work with Dr. Andre Obenaus in the Pediatrics Research Division at Loma Linda University. Our project consisted of looking at the differences in cerebral vasculature in male and female mice from response to TBI. We focused on behavior analysis for both Open Field testing and Catwalk to determine gait and locomotor activity. Under the supervision of Mary Hamer, I was also able to learn several immunohistochemistry techniques. I am grateful to have this wonderful opportunity to further my educational and career goals.

TRAUMATIC BRAIN INJURY INDUCES GENDER-RELATED DIFFERENCES ON OPEN FIELD ANALYSIS

Rebecca Hernandez, Renissa Arnold, Bethann Affeldt, Arjang Salehi, Mary Hamer, Angela Avitua, Mohsen Baghchechi, Saburi Eliamani
Andre Obenaus, Amandine Jullienne

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

Traumatic brain injuries (TBI) are a major public health concern that constitute at least 30% of injury-related deaths in the United State, and an estimated 2.5 million emergency visits to hospitals each year. TBI are caused by an impact to the head and can have long term effects such as cognitive deficits, motor dysfunction, and high risk factors for numerous neurological disorders. Athletes, the elderly, and military personal constitute high-risk populations for TBI. Understanding these populations can give us an opportunity for prevention, but we also have to consider gender differences. It has been shown that male and female brains exhibit anatomic and neurochemical differences, and we know that in men and women, cognition appears to recover differently after a TBI. In experimental studies, there has been controversy concerning gender differences in behavioral indices, and little is known about those differences after a TBI. Here, we investigated behavior in male and female mice after TBI using the open field test to assess general locomotor activity levels. A moderate TBI was induced using the controlled cortical impact (CCI) model at an impact depth of 1.5mm on the right cortex. Behavior was observed at 1-day post injury (DPI) as well as 8 DPI. Using the Noldus Ethovision XT 11.0 software, we measured the total distance traveled and the total velocity during a 24-minute test (separated by 3-minute time bins). At 1DPI, we found that during the first three minutes, females traveled an overall greater distance and traveled faster than males. At 8DPI, similar results were observed but were not statistically significant. Our results demonstrated that females displayed more hyperactive characteristics when compared to males at 1DPI but were similar to males at 8DPI. In conclusion, female and male mice respond to TBI differently, which can provide the pathway to different therapeutic approaches by gender.

PABLO HUERFANO

UTP PARTICIPANT 2016

"To leave this world a little better than you found it" is the motto of my life. My parents are immigrants from Venezuela where most of my family still resides. While very young, I witnessed poverty and financial inequality. Later, I realized even though sometimes my family struggled, I still had numerous opportunities most people do not have. This realization helped me understand why I want to dedicate my life to serving others.

At South Lancaster Academy, I expanded my love for science and service, receiving the Science Student of the Year Award and being elected VP of NHS where I helped start a community blood and clothing drive for local homeless shelters. I graduated with highest honors and as class president and am now a third year sophomore at Southern Adventist University pursuing a degree in biology. I served as a student missionary in Thailand over the last year, extending my undergraduate experience to five years.

My dream is to become a missionary doctor and serve wherever God needs me.
When not doing homework or cramming for tests, I play basketball, snowboard, and backpack, trying to spend as much time as possible exploring and admiring the outdoors. I really like challenging myself physically and mentally, constantly setting new goals and challenges.

This summer I had the privilege of working under Dr. Daisy De Leon in her breast cancer lab. Our research revolved around effects of IGF2 blocking antibody on breast cancer cells. I thank Xousaen Helu for constantly putting up with me and being a patient mentor. I also thank Vinodh Kumar Radhakrishnan and Qianwei Tan for teaching me new and valuable skills. This program has been an absolute blessing and great experience in transferring classroom knowledge into "real world" applications.

ANTIBODY AGAINST INSULIN-LIKE GROWTH FACTOR II (IGF-II) INCREASES INTRACELLULAR IGF-II IN TNBC CELLS

Pablo Huérfano, Xousaen Helu, Daisy De León

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

Breast cancer (BC) is the most common cancer among African-American (AA) women. Even though AA women have a lower BC incident rate than Caucasian American (CA) women, they suffer a higher mortality rate. This health disparity can be linked to socioeconomic factors, lifestyle, and a higher frequency of triple negative breast cancer (TNBC) in AA women. TNBC cells lack estrogen-α receptors, progesterone receptors, and HER2 receptors, making them aggressive and unresponsive to conventional hormonal therapies. Novel treatments are being developed to combat TNBC tumors, such as molecular therapies targeting insulin-like growth factor II (IGF-II). IGF-II plays a pivotal role in cancer development by signaling through the IGF-I and Insulin receptors, thus regulating proliferation, apoptosis and energy production. These new treatments target IGF-II using IGF-II antibodies (IBA) to lower circulating IGF-II levels to slow or stop tumor growth. In this study, we use MDA-MB-231 and CRL-2335 TNBC cell lines acquired from a CA and AA patient, respectively, to better understand the effects of IBA on IGF-II expression. Serum-free cultures of MDA-MB-231 and CRL-2335 were treated with IBA and then terminated at distinct time points. Protein samples from cell cultures were extracted, concentrated, and stored for analysis in SDS PAGE gels and transferred into PVDF membranes. Western blots were used to identify IGF-II isoforms, and the PVDF membranes were scanned and IGF-II bands quantified. Neither cell line expressed IGF-II at baseline (control, Time 0). In contrast, both cell lines expressed IGF-II after 15 minutes with IBA treatment. MDA-MB-231 cells showed the highest level of IGF-II after 12 hours while CRL-2335 IGF-II levels 24 hours. The early increase in IGF-II levels (15 minutes) following IBA treatment suggests initial IGF-II changes occurred at the translational level. We propose the early increase in IGF-II levels following IBA treatment is a protective cellular early response to decreased extracellular IGF-II. Sustained increased IGF-II levels prevents apoptosis and promotes chemoresistance.

MARIAH JACKSON

UTP PARTICIPANT 2016

Born and raised in Cincinnati, OH, I am an introverted extrovert who finds strong opinions weakly held as unacceptable. I am a Black American female facing a mountain of statistics to climb with a survival sack, tied up boots, and a God who supplies all of my needs. I am silly and I love to make people laugh. I believe first impressions are important but can easily be forgotten if the following encounters do not match the initial one. This is why I am constantly striving to better myself.

I am trying to defy the pressures of being a societal puppet. Like everyone around me, I am not seen for who I truly am. I am seen as a collection of numbers thrown into the complex and subjective algorithm of others' brains to determine if I am worthy. However, I am not just my address, class rank, GPA, or phone number. I am a person. I am striving to be a health professional who refuses to view my patients and their ailments as a means for financial gain or personal fame.

Having completed my third year as a biology student at Oakwood, I have developed my own research which I will continue to pursue with diligence until I receive my PhD. I have learned research is not a competition based off who can gain the most publications, but instead it is a commitment to defend those who may not be able to defend themselves. Research also gives me the chance to continue to fight for those who are fighting physically against illness and disease. I do not want to change the world per se; I just want to have a positive impact on those that live in it.

TSLP CYTOKINE EFFECTS ON BCL-2 PRO-DEATH PROTEINS IN HIGH-RISK CHILDHOOD LEUKEMIA

Mariah Jackson, Pierce McCarthy, Cornelia Stoian, Kimberly Payne

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

A type of B cell leukemia called CRFL2 B-ALL disproportionately impacts Hispanic/Latino children. This disease is a major concern for our community because it has a high relapse rate (due to chemoresistance), and it occurs 5 times more often in Hispanic children than children of other races. TSLP is a cytokine thought to contribute to the chemoresistance of CRLF2 B-ALL because these leukemia cells express abnormally high levels of the receptor protein CRLF2. Binding of TSLP to the CRLF2 receptor protein induces JAK/STAT and MTOR pathway activation. These two pathways are known to regulate cellular processes including apoptosis. One way they regulate apoptosis is through their effects on the Bcl2 family of proteins that includes both pro-death and pro-survival proteins. Our previous work showed TSLP increases the expression of the BCl2 family pro-survival protein Mcl-1. In the studies described here we are interested in TSLP's effect on the expression of pro-death molecules in the BCL2 family and their role in apoptosis of CRLF2 B-ALL leukemia cells. We designed *in vitro* experiments to observe TSLP's effect on expression of the BCL-2 family pro-death proteins, Bad and Bax, in two CRLF2 B-ALL leukemia cell lines. The CALL-4 and MUTZ-5 cell lines were cultured with physiological (0 – 50 pg/μL) and supraphysiological levels (15 ng/μL) of TSLP. After 3 days in culture, using flow cytometry, we observed differences in Bad and Bax expression related to TSLP concentration. These studies will help us understand how TSLP impacts the equilibrium of these pro/anti-apoptotic molecules and how this interplay impacts CRLF2 B-ALL chemoresistance. Understanding these protein mechanisms will help us design therapeutics that preserved normal JAK/STAT signaling while inhibiting Mcl-1's anti-apoptotic effects.

DUSTIN JAMES

UTP PARTICIPANT 2016

When I participated in the 2012 ABC program, I stated my career goal as going to medical school and becoming an orthopedic surgeon. Four years later I can confidently say I have little to no idea what I plan on doing in the future. Despite my uncertainties for my career, I adore everything I am learning at the University of California, San Diego. After changing my major four times since entering college, I am proud to have finally found my calling in ecology, behavior, and evolution. I love learning about this planet's development and the unique creatures that inhabit it, particularly insects and spiders. While I still do not have a solid career path, I hope my lust for new experiences will help me find something I can enjoy doing for the rest of my life (or at least the next five years).

This past year I lived in a two bedroom apartment with four other guys. Though it was ridiculously cramped, I enjoyed (almost) every minute of it. I consider my friends to be not only my extended family but a representation of myself, and I have learned so much about who I am and the world around me because of all their differing perspectives on life. You can only know so much as what your environment feeds you. In order to truly learn more, you need to be introduced to an individual who has encountered situations completely different from your own. I firmly believe that.

I would like to give a sincere thank you to Dr. Susanne Montgomery for allowing me to be a part of her amazing team at the Behavioral Health Institute and trusting me, a person whose research experience is primarily grounded in spiders, with helping out on this project.

THE INFLUENCE OF PARENTAL RELATIONSHIP ON CHILD FUNCTIONING

Dustin James, Joshua Nwosu, Rebecca Ballinger, Kimberly Freeman,
Sigrid James, Susanne Montgomery

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

Biopsychosocial theory suggests adolescents begin developing problem behaviors associated with Borderline Personality Disorder, such as self-harm and suicidality, primarily due to a biological disposition combined with an invalidating environment. The SOAR program addresses chronic invalidation within the family environment and aims to help self-harming adolescents achieve emotional stability and improved functioning in spite of family dysfunction. This study focuses on the role family plays in the functioning of a self-harming adolescent. Data from an outpatient pilot study with graduates from an intensive outpatient treatment (N=15) were used to assess child functioning using the Youth Outcome Questionnaire (YOQ) while family dynamic was measured using the "Relations with Parents" scale on the BASC-2. Specifically, we compared adolescents who were in the clinically significant range (YOQ > 47) and those who were not (YOQ < 47). We first used bi-variable tests to explore associations between familial communication and child self-efficacy and the parent-child relationship and then used linear regression to explore multivariate patterns. For adolescents in the clinical range, the better their relationship with their family, the lower their distress at the end of treatment. When examining adolescents in the non-clinical range, although family functioning was not significant, it had an inverse relationship with overall functioning. For this group, functioning was significantly impacted by adolescent self-reliance. Results suggest a good relationship with one's family may be the best medicine for self-harming adolescents who are not at the optimal level of functioning while individuals who have begun to function normally will rely more upon themselves in order to improve. As such, when adolescents are in the clinical range, outpatient programs should continue to actively engage parents in a DBT-based treatment process while those who are no longer in the clinical range may be ready to move to a program that helps them learn and practice skills that help them rely on and trust in themselves.

DANIELLE LITTLE

UTP PARTICIPANT 2016

I am a junior biochemistry student at Oakwood University in Huntsville, AL. There I work under the instruction of Dr. Marlon Rhem doing computational chemistry. During high school, I discovered science and law are the only academic subjects I most enjoy, so I have chosen to obtain a PhD, attend law school, and pursue a career in patent law. The subject of my PhD has yet to be decided on.

My mother was a graduate of Yale University and Wake Forest Medical School, and living up to her prestige has always been something I felt I needed to do. Making my parents proud has been and continues to be a driving force in my life. School has not always been my forte, and deciding what I want to be has always been difficult. There was a lot of pressure to become a doctor like my mother, but I had to find out what I wanted to be. Figuring that out, to me, has been my greatest accomplishment. Finding yourself in a world where people expect you to look a certain way or have a certain job can be challenging. I applaud anyone who dares to go against the status quo. Research is what I discovered I loved to do, and I'm so glad I did.

I have enjoyed my time here at Loma Linda University. My PI is Dr. Marino De Leon and my mentor is Miguel Serrano. I love my lab and the people I work with. Although they all speak Spanish and I only speak "un poquito," my time here has inspired me to refine my Spanish skills. Most importantly, I have learned many research techniques that will definitely help me advance in the future.

USE OF RT-PCR TO QUANTITATE MRNA LEVELS OF MYELIN PROTEINS IN IMMORTALIZED SCHWANN CELLS TREATED WITH PA OR DHA AND SCIATIC NERVES FROM SPRAGUE-DAWLEY RATS FED SOY OR DHA ENRICHED DIETS

Danielle Little, Miguel Serrano Illán, Marino De Leon

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Diabetic neuropathy (DN), a co-morbidity of diabetes, results from increased exposure to high concentrations of glucose and saturated fat (glucolipotoxicity) in the peripheral nervous system. Schwann cell death and dysfunction results in diabetic neuropathy induced axonal demyelination. Myelin proteins are essential to the process of myelination, each one having a functional or structural role to play. In our experimental model we used rat sciatic nerves and Schwann cells (SCs) to characterize the mRNA expression of Myelin Basic Protein (MBP), Myelin Protein Zero (P0), Myelin Associated Glycoprotein (MAG), and Peripheral Myelin Protein 22 (PMP22) following treatment. We fed rats with diets enriched with either fish oil, rich in omega-3 fatty acids like docosahexaenoic acid (DHA), or soybean oil, rich in omega-6 fatty acids. Furthermore, immortalized Schwann cells (iSCs) were treated with DHA, or palmitic acid (PA). DHA has been shown to ameliorate neuronal injuries, and thus we hypothesized it may prevent/ameliorate Schwann cell death and/or dysfunction. To analyze the aforementioned genes, quantitative real time polymerase chain reaction (qRT-PCR) was carried out, and it was found treatment of iSCs with PA has a tendency to decrease myelin protein mRNA expression at early time points. However, expression levels return to baseline at 12 and 24 hours. On the other hand, DHA and PA co-treatment or DHA alone prevents decreases in mRNA expression for the genes of interest. qRT-PCR data from rat sciatic nerves showed a decrease in PMP22 and an increase in MAG and MBP mRNA expression in DHA-treated animals following metabolic injury to the PNS. The qRT-PCR data also suggested the same injury decreases P0 expression in both DHA and soy diet. Taken together, these data suggest a diet rich in DHA regulates the most important myelin proteins following sciatic nerve injury.

QUINCY MONROE

UTP PARTICIPANT 2016

Before arriving at Oakwood University, I ambitiously decided psychology would be my major as well as my passion. I had just finished my second year of college, and I, as well as many, was shocked to have developed an interest for research pertinent to social issues. In need of exposure, I found my place in a program called Increasing Minority Admission into Research Institutions (also known as IMARI), an invitation to an in-depth version of science relevant to many social diseases today. Being a part of IMARI gave me the push I needed. Before learning about biomedical research, all I knew was psychological research.

I then came to the conclusion that anything biological is also psychological. Neuroscience is my integration of these two. As a participant in this year's UTP, I have learned to appreciate biomedical research as well as the health disparities that come with it. I am indebted to my mentor, Dr. Salma Khan, for encouraging me to one day pursue an MD/PHD.

Our research is focused on solving the susceptibility of thyroid cancer among Filipino populations. Her mentorship enabled me to love what I do and do it for the right reasons. The most interesting aspect of research to me is the search: knowing more is out there and seeking underlying causes even when the layman could care less, and knowing a difference can be made despite the odds. A quote that endeared me to research and is pertinent to my interest is by David Viscott. He said, "The worst thing that one can do is not try, to be aware of what one wants and not give in to it, to spend years in silent hurt wondering if something could have materialized—and never knowing."

PATHOPHYSIOLOGICAL SIGNIFICANCE OF ENIGMA ONCOPROTEIN IN THYROID CANCER GENDER DISPARITIES

Quincy Monroe, Marino De Leon, Salma Khan

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

Thyroid cancer is a prevalent endocrine-related disease with a rising rate of incidence across the general population. In addition, it is the sixth most common cancer among women and less common for men, particularly in papillary thyroid cancers. The reason for this gender discrepancy is still unknown. Although estradiol may play important role in it, no direct correlation has been established so far. Therefore, our present study will elucidate a pathway of estradiol via activation of a novel oncorpotein in thyroid carcinogenesis. Thyroid nodules are found in one out of twelve premenopausal women. Most of these nodules are benign and 5-10% of these nodules are malignant. These determinants, however, require the guided use of medical imaging or the added use of an invasive biopsy, which is likely to be used when there is suspicion of malignancy. However, due to lack of molecular markers, benign nodules get overtreated or misdiagnosed. Thus, there is a crucial need for a minimally invasive, highly distinguishable molecular marker to identify between benign and malignant nodules. A recently discovered protein called Enigma (PDLIM7) may play a discriminatory role in the matter. In our study, we hypothesized Enigma to be an effective biomarker in thyroid cancer, specifically in a subtype known as papillary thyroid cancer (PTC) in females. Through the use of immunohistochemistry (IHC) staining, 99% of papillary thyroid cancers showed overexpressed Enigma as well as a high rate of microcalcification in female PTC bound to a cofactor known as body morphogenetic protein 1 (BMP-1). Our results indicate the colocalization of both Enigma and BMP-1 is highly suggestive of an interactive role in PTCs. A direct correlation between estradiol and Enigma in the cell lines needs to be established.

ANGELA MORALES

UTP PARTICIPANT 2016

"Hey, do you ever just look at these trees and imagine there's nothing stopping you from seeing a beautiful system of vasculature? Nothing stopping you from visualizing all the enzyme catalyzed reactions, all the infections being fought off, all the chemical activity occurring at this *very* moment?"

"Uh, no, Angela, I don't."

That mode of thinking runs in my family, accompanied by a passion for sharing it. I am now entering my fourth year as an undergraduate biochemistry and molecular biology major, and my fascination for life's intricacies continues to grow. This field has allowed me to dissect what drives living systems, connecting minute, chemical and physical details to broad concepts in order to hypothesize how to face today's unknowns.

This summer I have had the pleasure of working closely with Dr. Reinhard Schulte on Glioblastoma Multiforme (GBM) research with additional guidance from Dr. Ying Nie. As I have a deep interest in the analysis and visualization of datasets, neuroscience, and technology, I was individually tasked with answering two questions: How can the tumor's borders be better imaged? And how can radio-resistant C-6 progenitor cells be imaged and located? Both questions are aimed at improved GBM radiotherapy treatment planning.

Upon graduation, I plan to pursue graduate studies within a PhD program in an area that allows a combination of biomedical sciences with technology. I am interested in a research career involving biomedical engineering, neuroscience, and biochemistry. Inspired by my father and grandfather's passion for their work, I aim to secure a similarly lasting passion in my life, contributing to innovation with a dedication to improving the lives of others.

NOVEL APPROACHES TO DETECTION AND IMAGING OF GLIOBLASTOMA STEM CELL NICHES

Angela Morales, Ying Nie, Irene Qazi, Gabriel Martinez, Reinhard Schulte

Center for Health Disparities and Molecular Medicine, Department of Biochemistry, Department of Neurosurgery, Department of Basic Science, Division of Radiation Research, School of Medicine,
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Glioblastoma multiforme (GBM) is the most common malignant brain tumor in adults with dismal prognosis. Evidence of the existence of stem cell niches and their role in tumor recurrence has begun to accumulate. The purpose of this research is to (1) optimize the identification of these stem cell niches *in vitro* and (2) use modern imaging techniques to locate stem cell niches *in vivo*. The literature on stem cell niches in GBMs was reviewed with emphasis on molecular and metabolic imaging. The most promising methods to detect and image GBM stem cells include PET scanning and magnetic resonance spectroscopy imaging (MRSI) of GBM stem-cell specific metabolites. With *in vivo* translation in mind, a first experiment was designed to find the optimal cell concentration for the human GBM cell line U251 in culture to accurately detect metabolic signatures using MR spectroscopy (MRS). U251 cells were cultured in a 75 cm^2 cell culture flask in DMEM supplemented with 10% fetal bovine serum and antibiotics and grown to a concentration of 10^7 cells/mL. The stem cell solution was diluted to concentrations of $5x10^6$, $3x10^6$, and $1x10^6$ cells/mL, respectively. The diluted cells were placed into a 5-mm NMR tube holding 0.6 mL in preparation for nuclear magnetic resonance (NMR) measurements (Bruker Avance 500 MHz). A series of scans were taken and compared. In addition, we are planning to grow U251 neurospheres in non-permissive media allowing only stem cells to grow. Non-stem-cell preparations and stem cells will be mixed in different concentrations to detect different signatures, which may eventually be utilized *in vivo*. We expect results obtained with NMR of human stem cell cultures *in vitro* will inform the development of using MRSI for GBM tumors in experimental animals and eventually in human GBM patients. The development of new methods to target GBM stem cell niches with high specificity and sensitivity promises to lead to a longer life expectancy and eventually a cure for patients with GBM.

EUNICE NYASANI

UTP PARTICIPANT 2016

"Lest we forget" are words often spoken by a true role model, my father. Why do I go by them? Born and raised in the motherland, Kenya, was not an easy task. Ten years in Kenya is an experience I can never forget because it keeps me grounded. Being an Oakwoodite, a student at Oakwood University in Huntsville, AL, also keeps me grounded. Oakwood has opened me up to many opportunities such as working with Dr. Volkov, a chemistry professor, who continues to teach me the ropes when it comes to research, and I'm privileged to have published two manuscripts in electrophysiology under him.

Coming to Loma Linda University has been a dream come true because the prestige it carries here in the US and in Africa is so great. I prayed to be assigned to a PI/mentor I could go along with, and I got that and more. Dr. Salma Khan has given me so many lessons for my career and life, and for that, I appreciate her very much.

Thyroid cancer isn't in the spotlight as often as breast cancer or other cancers. Dr. Khan has influenced me to share the passion of understanding what thyroid cancer does and also how it impacts the Filipino culture more than any other. We are trying to depict what the genetic and environmental/ethnic factors are when it comes to thyroid cancer.

The many speakers who have presented in the meetings have made me realize the need for awareness when it comes to health disparities. They have made me want to be the best as I, God willing, attain an MD/PhD in cardiology and anatomy and physiology and never give up so that many lives can be reached.

VITAMIN D BINDING PROTEIN POLYMORPHISM IN THYROID CANCER ETHNIC DISPARITIES

Eunice Nyasani, Mia Perez, Marino De Leon, Salma Khan

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

Thyroid cancer (TC) has been rapidly increasing nationally and worldwide. Consequently, Filipinos in California have a higher risk of developing thyroid cancer. There is no study to decipher the discrepancy among these populations; thus, TC in Filipinos appears an understudied area in the cancer field. Filipinos are known to be vitamin D deficient; therefore, we hypothesized that this deficiency may be the causative factor for TC. Although animal models and *in vitro* studies have shown vitamin D has an antiproliferative effect on thyroid cancer cells, the association between low vitamin D and thyroid cancer remains unclear. Past studies showed defects in the vitamin D binding protein (DBP), transporter of vitamin D, is directly associated with low vitamin D levels in the serum. Our goal for the present study is to detect the expression of DBP in TC patients. We analyzed DBP expressions in tumor specimens collected from Filipino and Caucasian TC patients. Our study aims to determine the association between DBP and TC in Filipinos and Caucasians. Formalin fixed embedded tissues were manually stained using a commercially available anti-DBP antibody and were then imaged and analyzed using Biorevo BZ 9000 fluorescence microscope. DNA from TC samples were isolated, and the PCR-restriction fragment length polymorphism (RFLP) method was used to determine DBP single nucleotide polymorphism (SNP) using a primer pair in 50 Filipinos and 50 Caucasians with TC. Filipinos showed a higher percentage of SNP frequency rate than Caucasians, matching the loss of DBP protein. We also found, as mentioned above, a significant loss of expression of DBP in Filipino patients compared to Caucasian patients. We conclude that DBP is potentially an associated factor for thyroid carcinogenesis in Filipino patients.

ANNA GIFTY OPOKU-AGYEMAN

UTP PARTICIPANT 2016

This past spring I received the MARC U*STAR scholarship at my home institution, University of Maryland-Baltimore County (UMBC). Shortly after, I learned I was also accepted into the McNair Scholars program. Both initiatives seek to diversify graduate schools through mentorship and community service. I plan to utilize the resources from each program to work towards an MD/PhD.

As someone who has always desired to educate and serve youths and children, I want to make my research relevant to this population. Consequently, I have spent the past two years exploring various areas of study relevant to this goal, including health informatics, biology, biomedical research, etc. I anticipate that with these areas and other relevant background knowledge, I will be better equipped in selecting the most appropriate focus of study and, by extension, career option.

I am convinced of my deep rooted love and desire to shape the future of the African diaspora. In fact, my keen interest in serving sub-Saharan African populations and African-American communities has shaped every academic-related decision since fifth grade. I am primarily interested in inspiring the next generation of Africans to be the best version of themselves academically, socially and otherwise. I would like to create the space for young people to change their own destiny while simultaneously contributing to the development of their community.

This summer I had the pleasure of working closely with Petreena Campbell, a doctoral student in Dr. Eileen Brantley's lab. She and I are exploring tamoxifen (TAM) resistance in estrogen-receptor positive (ER+) breast cancer. We are trying to understand wether the eradication of tumor-initiating cells in these breast cancers will help circumvent therapy resistance.

STEMNESS GENE A6 INTEGRIN MEDIATES TAMOXIFEN RESISTANCE IN ER$^+$ BREAST CANCERS

Anna Opoku-Agyeman, Petreena Campbell, Ubaldo Soto,
Gayathri Nagaraj, Eileen Brantley

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De novo and acquired resistance to tamoxifen (TAM), an agent commonly used to treat estrogen receptor positive (ER+) breast cancer, have significantly diminished its clinical efficacy. Hence, a need exists to target molecules within breast cancer cells that promote tamoxifen resistance. Emerging evidence suggests breast tumor initiating cells (TICs) contribute to anti-cancer drug resistance, owing to their ability to evade treatment and self-renew. α6 integrin promotes TIC capability and survival via pathways associated with TAM resistance. Furthermore, previous studies indicate an association between α6 integrin variant B (α6vB) cytoplasmic expression, and TIC potential. TAM increases TIC properties in mammary tumors, promotes mammosphere formation (an *in vitro* model enriched for TICs), and increases α6 integrin expression. In contrast, anti-tumor aryl hydrocarbon receptor (AhR) agonist aminoflavone (AF) disrupts mammosphere formation and thwarts α6 integrin expression. Consequently, we hypothesized that α6 integrin overexpression confers TAM resistance and suppressing α6 integrin expression counteracts TAM resistance. Quantitative reverse transcriptase PCR (qRT-PCR) showed elevated basal α6 integrin expression in both luminal A (with acquired TAM resistance) and luminal B (with de novo TAM resistance) ER+ cell lines. The Alamar Blue assay revealed that TamR cells exhibited sensitivity to AF. Semi-quantitative RT-PCR indicated α6B overexpression in TamR cells and the ability of AF to reduce both α6 integrin variant A and α6vB expression in TamR and parental cells. Anti-α6 integrin blocking antibody NKI-GoH3 sensitized TamR cells to the active TAM metabolite 4-hydroxy-tamoxifen and enhanced AF efficacy in these cells. These findings suggest α6 integrin behaves as a novel mediator of TAM resistance and highlight the therapeutic potential of anticancer AhR agonists such as AF to effectively counteract such resistance. This is significant since combating TAM resistance is expected to decrease breast cancer related mortality and improve clinical outcomes.

EVELYN SANCHEZ

UTP PARTICIPANT 2016

I will begin my last year as an undergraduate student this fall, majoring in cell and molecular biology at California State University, Northridge. Throughout my undergraduate career, experiences have shaped my purpose in life. Observing a member of my family affected by cancer made me realize the importance of biomedical research in our society. Many patients' lives depend on the answers that scientists seek in their laboratories. I want to contribute to finding cures to diseases and, thus, save people's lives.
My goal is to pursue a PhD degree and be able to make a difference in people's lives through biomedical research.

Being a MARC scholar has given me the opportunity to conduct biomedical research and discover that I love doing research. I work in Dr. Rheem D. Medh's lab at CSUN, and her laboratory is studying the molecular pathways that govern chemotherapeutic agent-induced apoptosis in cell culture models of human acute lymphoblastic leukemia. My project involves the investigation of genes in leukemic lymphoblastic cells regulated by glucocorticoids (GCs).

This summer I had the privilege of working in Dr. Carlos Casiano's laboratory. I studied the relationship between the oncoportein LEDGF/p75 and glucocorticoid receptor (GR) to determine if their upregulation is mediated by one another. I'm grateful for the support that I received during this summer and for the mentorship Leanne Burnham provided me. This experience not only exposed me more to the scientific world but encouraged me to continue working to pursue my goal.

GLUCOCORTICOID-MEDIATED UPREGULATION OF STRESS ONCOPROTEIN LEDGF/p75: IMPLICATIONS FOR PROSTATE CANCER HEALTH DISPARITIES

Evelyn Sanchez, Leanne Woods-Burnham, Kwame Amponsah, Christina Cajigas-Du Ross, Arthur Love, Anamika Basu, Susanne Montgomery, Colwick Wilson, Carlos Casiano

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

The role of glucocorticoid receptor (GR) signaling in prostate cancer (PCa) progression is under intense investigation. While palliative therapy with synthetic glucocorticoids is administered to PCa patients undergoing androgen deprivation treatment or chemotherapy, increased GR expression in these patients correlates with worse prognosis. In addition, patients with aggressive PCa have higher serum levels of endogenous glucocorticoid (cortisol) than patients with early stage PCa. The emerging role of glucocorticoid-driven PCa aggressiveness is especially problematic for African American (AA) men, as previous studies have demonstrated chronically elevated serum cortisol levels and increased PCa aggressiveness in AA men compared to European American (EA) men. However, the molecular mechanisms underlying GR-mediated PCa aggressiveness are not clearly understood. We hypothesize that GR signaling in PCa cells may activate stress pathways underlying chemotherapy resistance and may disproportionately operate in AA men. We evaluated the effects of GR activation on the expression of the stress oncoprotein LEDGF/p75, implicated in chemotherapy resistance in PCa cells. We exposed a racially diverse panel of PCa cell lines (MDA-PCa-2b, 22Rv1, PC3, and DU145) to physiological concentrations of cortisol or dexamethasone (synthetic glucocorticoid) for up to 48 hrs and observed by Western blotting the upregulation of GR and LEDGF/p75 in treated cells. Results were quantified using Image Studio™ and t-test statistical analysis. Co-treatment of cells with GR antagonist mifepristone attenuated glucocorticoid-induced LEDGF/p75. In addition, silencing of LEDGF/p75 in PC3 cells decreased GR expression, suggesting a functional interplay between these two proteins. Furthermore, we quantified by ELISA the serum levels of LEDGF/p75 in PCa patients and observed higher levels in AA PCa patients compared to EA patients and controls. These studies represent a first step in elucidating the contribution of GR signaling to activation of the LEDGF/p75 chemotherapy resistance pathway in PCa, particularly in the context of PCa racial disparities.

CLAIRE STEWART

UTP PARTICIPANT 2016

Mahatma Gandhi put it best when he said, "The best way to find yourself is to lose yourself in the service of others." Throughout my life I found one of my greatest joys to be in serving others, and it is something I will always strive to do. Now as I am starting my third year at Oakwood University in Huntsville, AL, I still believe service should be a central part of my life. While studying to complete my Bachelor of Science degree in biochemistry, I continue to serve others and increase my knowledge in science as I venture towards my professional career. It is my love for God, science and others that drives me more and more to pursue obtaining an MD/PhD.

This summer I had the opportunity to work under the direction of Dr. Christopher Perry and with the guidance of Dr. Ryan Sinclair and Dr. Danilo Boskovic going between their labs and learning as much as possible. I was able to work with silver/gold bimetallic nanoparticles and test their antimicrobial properties with aerobic and anaerobic bacteria. I also learned the many different applications nanomaterials can have in the world today. Working with something so versatile shows me the growth in scientific research that can change lives and help so many people.

I am an avid reader, and often time you can find me enjoying some good reads at the closest Starbucks. I also enjoy crocheting and spending time with my family and friends.

ANITIBACTERIAL INHIBITORY AFFECT OF SIZE-CONTROLLED SILVER GOLD NANOPARTICLES WITH *PORPHYROMONAS GINGIVALIS* W83

Claire Stewart, Erwin Stuffle, Elvin Walemba, William Chen, Danilo Boskovic, Ryan Sinclair, Christopher Perry

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

Porphyromonas gingivalis (*P. gingivalis*) is an obligate anaerobic bacterium that contributes to the development of periodontal diseases. It is found in the periodontal pocket of the oral cavity and is involved in the pathogenesis of periodontal disease. Silver-gold nanoparticles (Ag/Au NPs) are tested to see if they cause growth inhibition of *P. gingivalis* which will reduce the involvement of the bacterium in forming periodontal disease. Ag/Au NP were synthesized through a galvanic replacement reaction with maltose coated Ag NPs and chloroauric acid in 5% aqueous triblock F127. Forty percent (40%) L31 was used in the production of the NPs to insure a more uniform size and were then the NPs were capped with glutathione (GSH). A pilot study was conducted using clinical strains of *Methicillin Resistant Staphylococcus aureus* (*MRSA*) to obtain a concentration range needed against bacteria. The bacterial growth effects of the NPs were tested by using a spot plate method after one, two, four, and 24 hours. The colony forming units (CFUs) for *MRSA* were counted, and how the *MRSA* changed with the different amounts of NPs was observed. This data was then used to determine the concentrations of NPs that should be applied in the same way to the *P. gingivalis*. Planktonic growth curves were done with by measuring the optical density of *P. gingivalis* in three hour increments for twenty-four hours. The data showed that *P. gingivalis* grew less when in the presence of a good concentration of NPs.

ERWIN STUFFLE

UTP PARTICIPANT 2016

For the past two years I have been a student at Oakwood University, located in Huntsville AL, pursuing a Bachelor of Science degree in biomedical science. Before that, I earned an Associate degree in environmental science from Harrison College on the island of Barbados. Having grown up and lived in the Caribbean for all of my life, coming to study in the USA was definitely the most pivotal point in my life, apart from the day I met Jesus Christ, of course!

Currently at Oakwood, I am afforded with many opportunities to serve my community. During my recently concluded sophomore year, I assisted in building the STEM curriculum at Oakwood Adventist Academy, particularly with the 4th grade students. It was definitely a life changing experience to help in nurturing those young minds.

This summer I had the privilege of working along with my mentors Dr. Christopher Perry and Dr. Ryan Sinclair in investigating the antimicrobial potential of silver nanoparticles against multidrug resistant bacteria such as MRSA. I am very thankful to them both and my other colleagues who helped to make this experience such a valuable one. In the past I have worked with Dr. Elaine Vanterpool in analyzing the mechanisms of virulence modulation in *Staphylococcus aureus.* It is my goal to obtain an MD/PhD, working in the fields of infectious disease and molecular genetics. I hope to one day make significant contributions in the fight against HIV, a disease affecting millions of people worldwide.

In my spare time, you can find me going for a run, doing some cycling or engaging in some other form of physical activity. I am also a classically trained musician, being a player of the clarinet and saxophone.

THE ANTIBACTERIAL PROPERTIES OF SILVER-GOLD BIMETALLIC NANOPARTICLES AGAINST MULTIDRUG-RESISTANT PATHOGENS

Erwin Stuffle, Claire Stewart, Matthew Lu, Elvin Walemba, Danilo Boskovic, Elaine Vanterpool, Ryan Sinclair, Christopher Perry

Center for Health Disparities and Molecular Medicine, Department of Biochemistry, School of Medicine, School of Public Health, Loma Linda University, Loma Linda, CA; Department of Biological Sciences, Oakwood University, Huntsville, AL

In the practice of medicine, antibiotics are commonly used as a first line of defense against infections caused by bacterial pathogens. While these drugs have proven effective in treating such infections, over time the bacteria develop a genetic resistance to them. This has led to the occurrence of multi-drug resistant pathogens such as Methicillin-Resistant *Staphylococcus aureus* (MRSA). Hence, new methods of treatment must be developed. Here we investigate the efficacy of polymer coated, bimetallic Silver-Gold Nanoparticles (Ag/Au NP) at inhibiting growth in MRSA, *Staphylococcus aureus* and *Serratia marcescens*. We synthesized glutathione capped Ag/Au bimetallic nanoparticles by galvanic replacement reaction between maltose coated Ag NP's and chloroauric acid ($HAuCl_4$) in 5% aqueous triblock F127 copolymer solution. The bacterial cultures, suspended in PBS, were incubated with various concentrations of Ag/Au NP. At 0, 1, 2, 4 and 24 hours, samples were spotted onto agar plates. After 16 hours incubation, the colonies on the plates were counted. In *S. marcescens* and *S. aureus,* after 4 hours there was full inhibition of growth when incubated with a 1% solution of the bimetallic nanoparticles. In MRSA strains 148 and 209, there was a partial inhibition of growth using a 1% treatment after 4 hours. However, after 24 hours, both strains showed full susceptibility to the nanoparticle treatment. Our data suggests that Ag/Au bimetallic nanoparticles can be effectively used to inhibit growth in the aforementioned pathogens and holds potential to demonstrate a similar effect in others.

ANNA WHITE

UTP PARTICIPANT 2016

Avvα, Language of origin: Greek
Translation: Anna, Language of origin: German

Named after the prophetess in the Greek NT, I have always strived to live up to my name's predecessor—to be able to "see" and exemplify Jesus in whatever task I undertake. With this model in mind, I aspire to become a medical doctor as well as a researcher and am currently in my junior year at Oakwood University, pursuing a biomedical sciences degree. I have participated in my university's student government as a senator and am passionate about service and people. Community involvement has been a part of my life through participation in Vacation Bible School, the Salvation Army, and the local hospital. In my free time, I enjoy exercise, watching the sunrise, socializing with my peers, and playing instruments.

Throughout my experience in the lab of Dr. Kimberly Payne, I have found Winston Churchill's words ringing true with each experiment performed, "...Failure is not fatal...it is the courage to continue that counts," and as researchers, this courage is exemplified experiment after experiment. My fellow interns and I are studying high risk B cell Acute Lymphoblastic Leukemia (B-ALL). Working with Nathaniel Mambo and Cornelia Stoian, my research focus is on the effect of different concentrations of TSLP on the apoptosis in B-ALL leukemia cell lines.

My UTP experience as well as my previous experience in MITHS have been invaluable. I have gained a greater understanding of working in a research lab and how my work can benefit the underprivileged and underserved, alleviating health disparities. Without the understanding and guidance of my lab mentors and PI, my eight weeks at the CHDMM would not have been a success, and I am greatly indebted to everyone in Dr. Payne's lab and to the program organizers.

TSLP'S EFFECT ON CANCER CELL SURVIVAL IN HIGH-RISK PEDIATRIC LEUKEMIA

Anna White, N. George Mambo, Cornelia Stoian, Kimberly Payne

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

CRLF2 B-ALL is one of the most common types of Ph-like B-ALL and is more challenging to treat compared to other forms of B-ALLs. Overexpression of the cytokine receptor component, CRFL2, is characteristic of high-risk CRLF2 B-ALL which disproportionately affects those in the Hispanic/Latino pediatric community. Together with IL-7Rα, CRLF2 creates a receptor complex that binds TSLP. Once bound, TSLP activates the JAK-STAT and mTOR pathways which plays a role in promoting B cell division and survival. Due to this propagating activity, TSLP has been thought to play a role in fueling the oncogenesis of CRLF2 B-ALL. Our lab is interested in TSLP's effect on leukemia cells' death due to apoptosis, which could contribute to chemoresistance in CRLF2 B-ALL. Our lab has observed supra-physiological levels of TSLP appear to increase the apoptosis of CRLF2 B-ALL cells. To test our hypothesis, we began to evaluate physiological levels of TSLP to determine their effect on apoptosis of CRLF2 B-ALL. Apoptosis can be distinguished from other cell deaths through the phosphatidylserine presented on the outside of the cells' membranes in addition to active caspases' present inside the cell. To establish the amount of apoptosis when TSLP is involved, B-ALL cells (MUTZ-5 and CALL-4) were plated with a range of physiological TSLP concentrations. Subsequently, flow cytometry was used to identify cells containing activated caspases by intracellular staining with Caspase 3/7 FITC and cells with phosphatidylserine on the outside of their membranes by staining with Annexin V PB. Our preliminary results show that physiological levels of TSLP did not induce changes in apoptosis. Further experiments will be needed to ascertain if physiological levels of TSLP can protect CRLF2 B-ALL from death in the presence of chemotherapies, representing a potential mechanism of chemoresistance. Understanding factors that increase apoptosis will be of paramount importance in developing therapies to overcome chemo-resistance in CRLF2 B-ALL and in reducing health disparities in pediatric cancer.

Medical Training Program (MTP)

Elysia Cohen
Kristoff Foster
Sarah Fowler
Yllen Hernandez
Franz Mendoza
Héctor Nieves
Maria Pagan
Arsenio Reyes Rivera

ELYSIA COHEN

MTP PARTICIPANT 2016

I am a second year medical student at Loma Linda School of Medicine. I love to expand my mind and learn new things. The most important thing I have learned this past year is that there is so much that is unknown. The answer given for multiple questions asked during this school year was that the answer has not yet been discovered. I realize as a doctor there will be patients with conditions that I will be able to treat and others that I will not be able to treat because therapies are not yet available. This is why research is vital. It provides a systematic method of answering the unanswered questions that lead to a better understanding of the human body and how to heal it.

Although research is vital, it requires perseverance. It is full of failed attempts, readjustments, and collaboration. At times it can be extremely frustrating with more failures than successes. But failures are stepping-stones to future successes. Nothing beats the feeling of having success after failed attempts. It humbles me to know that the project I have worked on in Dr. Wolffe Kirsch's lab this summer with the help of Carson Whinnery and Kristy Howard is a stepping stone to a future therapy that can change someone's reality and provide hope. Research provides endless possibilities, and this is why I have chosen to spend my summer in this program.

CHITOSAN-DNA NANOPARTICLE TRANSFECTION INTO HEK293 CELLS

Elysia Cohen, Carson Whinnery, Kristy Howard, Wolff Kirsch

Neurosurgery Center for Research, Training, and Education, Department of Biochemistry, School of Medicine, Loma Linda University, Loma Linda, CA

Dementia is a progressive brain disorder that gradually diminishes cognitive functions. Alzheimer's disease is the most common form of dementia. Cerebral amyloid angiopathy (CAA), characterized by the accumulation of amyloid beta plaques in the smooth muscle cerebrovasculature, is present in up to 90% of patients with Alzheimer's disease. Data suggest the mechanism of action of this condition is upregulation of the complement system. CD59, an important regulator of the complement cascade, is downregulated in CAA. We believe targeting the affected vessels with a CD59 plasmid in order to upregulate CD59 in the affected cells could potentially diminish the degeneration of the vessels seen in CAA. Chitosan is a biodegradable polysaccharide that is nontoxic and can cross the BBB. We hypothesize that plasmid DNA would be effectively transfected into the chitosan nanoparticles of increasing concentrations, and the nanoparticle would be effectively transcytosed into the HEK 293 cell as compared to lipofectamine. To determine the efficacy of the chitosan nanoparticle, we treated plated Human Embryonic Kidney (HEK) 293 cells with nanoparticles of increasing concentrations and also Lipofectamine. Using fluorescence microscopy, we discovered Lipofectamine transfected the plasmid. There was evidence of transfection in the nanoparticle wells of neither the 48 nor 72-hour plates using fluorescence microscopy. We performed a Western blot as a secondary measure to determine nanoparticle transfection efficacy. We discovered an increasing amount of fluorescence synonymous with the increasing concentration of the nanoparticles in the 72 hour plate. This discovery suggests chitosan nanoparticles are capable of transfecting a plasmid into cells. These results indicate the possibility of using a chitosan nanoparticle as a vector for future therapeutic plasmid delivery.

KRISTOFF FOSTER

MTP PARTICIPANT 2016

In May 2016, I graduated from Oakwood University in Huntsville AL, with a BS in Biomedical Sciences. My undergraduate experience exposed me to service opportunities both in my school community and the Huntsville community at large. At school, a key service opportunity was peer tutoring. I especially enjoyed tutoring freshman biology majors in introductory biology and chemistry. During my junior year I collaborated to set up a tutoring program within the department of biological sciences at Oakwood University that serves as an addition resource for students looking to excel in specific science subjects. I was also able to work with the local community through activities such as regularly volunteering at a local homeless shelter.

This summer I have been working in the lab of Dr. Penelope Duerksen-Hughes. My project involved introducing the luciferase gene into a head and neck cancer cell line for simple detection of cancer cells injected into mice. I give a special thanks to Masha Filippov, Valery Filippov, Vasily Loskatov, and Sonia Whang for all your help, guidance and patience and to Dr. Hughes for the opportunity to learn in her Lab.

My career goal is to become a physician. As such, tomorrow I will be starting my medical education at Loma Linda University as a first year medical student. During my medical education I plan to continue to keep one of my favorite quotes from Ellen White in my heart: "It is not the capabilities you now possess or ever will have which will give you success. It is that which the Lord can do for you. We need to have far less confidence in what man can do, and far more confidence in what God can do for every believing soul."

CONSTRUCTION OF LUCIFERASE VECTOR FOR HEAD AND NECK CELLS LABELING

Kristoff Foster, Vasiliy Loskutov Valeri Filippov, Maria Filippova,
Penelope Duerkson-Hughes

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

HPV has been found to be a major factor in the increased incidence of certain head and neck cancers, especially those associated with the oropharynx. Around 60-70% of oropharyngeal cancers are HPV-mediated. Xenograft tumors in mice have proven to be useful and effective models for pre-clinical studies to develop new anti-cancer drugs. Currently, the effectiveness of potential drugs on xenograft tumor growth is determined by direct measurement with a ruler and scale to determine tumor dimensions and mass only in sacrificed animals. This method can lead to inaccuracies and cannot evaluate the metastasis of cancer cells. It also makes it difficult to monitor tumor growth over extended periods in live mice. For this reason, the aim of our project was to create a more useful method to evaluate tumor growth in live xenograft animals by developing head and neck cancer cell lines labeled with luciferase as a marker. First, we cloned the luciferase gene from the original pFRLuc plasmid into a new vector pcDNA3, which provides resistance to G418 antibiotics. This resistance enabled us to select for human cells harboring the integrated plasmid. The plasmid, pcDNA-LUC, was sequenced to confirm that the luciferase gene is under the CMV promoter and can be expressed in mammalian cells. This new vector was used for transfection of head and neck tumor cell lines UM-SCC47 and UPC1-SCC90 to detect the gene expression. Thus, we have constructed a new vehicle for the delivery and selection of the integrated Luc gene in mammalian cells which can be used to improve xenograft approach.

SARAH STEPHANIE-MARIE FOWLER

MTP PARTICIPANT 2016

My interest in basic science has always been an integral part of me. At 8 years old while other girls would be satisfied with Barbie dolls and Easy Bake ovens, my most memorable gift was a microscope. I remember as if it was yesterday, swabbing my siblings' mouths, preparing slides, and trying hard to get the perfect image in focus. This was only the beginning of my yearning for knowledge on how the human body worked and what we were all made of.

I recently graduated from the Sophie Davis School of Biomedical Education at the City College of New York receiving my Bachelor's of Science degree and simultaneously completing my first two years of medical school. I will be transferring to Albany Medical College next summer where I will graduate with the class of 2019.

Last year I volunteered in a fertility clinic in South Africa, and the many needs of the women in those underserved communities gave me a new perspective, a purpose, and a mission. I plan to pursue a career in women's health with a focus on reproductive medicine and hope to help bring new options of treatment to those who need it most.

This summer I have been blessed to work among the family that is Dr. Marino De León's laboratory. Between understanding the complexities of the different cellular mechanisms like autophagy and getting mini USMLE Step 1 quizzes from my mentor, Dr. Manuel Montero, I can say research is teaching me to have a constant innovative mindset, something I know will help me in the progressive field of reproductive medicine. I'm thankful for the plethora of knowledge I have gained in this summer's journey.

PC12 CELLS ARE RESCUED FROM PA-INDUCED LIPOTOXICITY BY DHA INDUCED AUTOPHAGY AS MEASURED BY BECLIN-1 AND LC3 ACTIVATION

Sarah Fowler, Manuel Montero, Jo-Wen Liu, Marino De Leon

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

Irreversible neuronal injury is the basis of common conditions like stroke, degenerative diseases, and peripheral neuropathy. The inability to walk, speak, or even see again are a few of the potential consequences of severe neuronal injury. When CNS injury occurs, an increase in fatty acids, mainly Palmitic Acid, a 16-carbon saturated fatty acid, is seen. This process is known as lipotoxicity as the fatty acids cause deleterious effects on neuronal cells. Some of these effects include, but are not limited to, increase in ROS products, MITOCHONDRIAL membrane permeabilization and other mechanisms which are pro-apoptotic. When apoptosis is inhibited in those conditions, a caspase-independent cell death process ensues. This process, for some in the field, is called necroptosis. Our laboratory previously showed that neuronal-like cells (NGFDPC12 cells) are vulnerable to Palmitic acid-induced lipotoxicity (PA-LTx). The default cell death pathway is apoptosis, but when inhibited with pan-caspases inhibitor Z-VAD.fmk, the cells still die via necroptosis. However, when treated with Docosahexaenoic Acid (DHA), an omega-3 fatty acid, these cells can evade the harmful effects caused by lipotoxicity. We hypothesize that treatment with DHA during PA-LTx inhibits the apoptosis pathway and induces the autophagy pathway in order to rescue the cell. In this study, a series of Western blots were conducted to determine the changes of autophagic biomarkers, specifically Beclin-1 and LC3 in NGFDPC12 cells that undergo PA-LTx and DHA treatment. Phosphorylation of Beclin-1 and lipidation of LC3 into its active form signal the cell for induction of autophagy and inhibition of apoptosis. Cell viability measured with WST-1 shows that artificially inducing autophagy with Rapamycin, inhibiting apoptosis with Z-VAD.fmk, and inhibiting necroptosis with necrostatin-1 during PA-LTx give similar results to when these cells are treated with DHA alone.

YLLEN HERNANDEZ BLANCO

MTP PARTICIPANT 2016

The first questions people ask when meeting me the first time are: What is your name? How do you pronounce it? How do you write it? My answer the majority of the time is first spelling my name, then pronouncing it, and finally telling the reason for my rare, not common name. My name is my mother's name, Nelly, but flipped to Yllen. I am a 24-year-old Puerto Rican woman. I describe myself as happy, respectful, friendly, social, kind, intelligent and responsible. I love to spend time with my family, friends and boyfriend. I also like to play guitar, go to church, hang out, dance salsa, listen to music, go to movies, and go to the beach.

I form part of the MD Class of 2019 at San Juan Bautista School of Medicine in Puerto Rico. When I finish my general medicine career, I want to apply to a residency in Puerto Rico and also in the United States. At present, the area of interest is gastroenterology; still, I am interested in other areas such as pediatrics, endocrinology, and nephrology.

As part of the MTP program at Loma Linda University, I am working with Dr. Abigail Benitez. The projects that I am contributing to are kidney transplant and lupus research. Both projects are based on health disparities and translational research. The main purpose of the projects is to link the clinical with scientific research, to improve clinical understanding about basic science conditions, and to promote and generate better treatments for the conditions previously mentioned. For me, this is an enrichment opportunity because through it, I understand the importance of research and how medical students like me can link it with the clinic.

THE EFFECT OF BELIMUMAB ON NONMEMORY B CELLS IN SLE PATIENTS: A TRANSLATIONAL RESEARCH APPROACH

Yllen Hernández Blanco, Derek Kao, Kimberly Payne, Michael De Vera, Michelle Ngo, Sheila Lezcano, Karina Torralba, Abigail Benitez

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

Systemic lupus erythematosus (SLE) is an autoimmune disease characterized by the production of auto-antibodies via B cells. SLE disease displays a health disparities component since prevalence is six times higher in women, nearly double in African American compared to White women, and higher in the U.S. South.To facilitate the flow of health disparities information from patients to research and then clinical practice, translational research studies are needed. In this study, we addressed the lack of categorizing methods to determine which SLE patients will benefit from B cell targeted therapy, Belimumab. The study included collaborations between rheumatologists and basic science researchers and a research strategy to develop a biological rationale for categorizing patients that may respond best to Belimumab. We used a translational research approach where we applied basic science knowledge of nonmemory B cell regulation by B cell activating factor (BAFF) and evaluated the effect of BAFF blocking therapy (Belimumab) on nonmemory B cells proportions in SLE patients. We used the CD21/CD24 translational model to identify mouse and human analogous nonmemory B cell subsets. PBMCS were isolated from healthy donors and SLE patients on Belimumab or standard of care therapy (SCT). Cells were stained for flow cytometry to identify nonmemory and memory subsets. B cells subsets were determined based on the frequency of each B cell subsets within the non-memory and memory pools and compared across treatment groups. One-way ANOVA test and Tukey's post-hoc test were used for statistical analysis. We found that the altered B cell subsets reflect mouse BAFF-blocking data. Human transitional studies suggest SLE patients have higher levels of transitional B cells compared to normal. For that reason if SLE patients exhibit an increased proportion of these cells, Belimumab may be a good candidate for them.

FRANZ MENDOZA-GARCIA

MTP PARTICIPANT 2016

The name given me, Franz Chartier Mendoza-García, is the same as my father's. Most people essential during every step I've made, including my parents, sister, friends, and myself, are Puerto Rican. Americans have asked why we Latin Americans include our second last name. I don't know the correct answer, but my personal answer is I include it to honor my mother's excellent care, hard work, sacrifices, and perseverance, qualities I inherited from her. I've had a hard time finding the meaning of my name since it's not common. Through all 22 years God has gifted me, my personality gave it its own meaning: a smart, caring, humble, nice person that stands up for something he believes in.

The combination of my curiosity for the unknown, how things work, and my life experiences created a chip on my shoulder to learn the gift of healing and proper care to provide people a better life style. After many years of hard work, ups and downs, and sacrifices, I'm one step closer to my goal by being a second year medical student at San Juan Bautista School of Medicine in Caguas, Puerto Rico. Each day I live in the pursuit of my final goal of being an excellent physician and teacher known for his contribution to different communities.

The CHDMM gave me the opportunity to work on the relationship of methylation differences in Parkinson Disease with my mentor Dr. Charles Wang and his colleague Dr. Xin Chen. It's been an honor to learn from their leadership and caring for the research team, qualities that will enhance my professional career as a physician. I have to admit that the program exceeded my expectations, and I can't be more grateful.

DNA METHYLOME OF HUMAN CORTEX AND SUSCEPTIBILITY OF PARKINSON'S DISEASE

Franz Mendoza, Xin Chen, Camellia Kani, Stephanie Tashiro,
Khashayar Dashtipour, Charles Wang

Center for Health Disparities and Molecular Medicine, Center for Genomics, Department of Basic Sciences, Department of Neurology and Movement Disorders, School of Medicine, Loma Linda University, Loma Linda, CA

Parkinson's disease (PD) diagnosis is primarily based on the clinical signs and symptoms, and only an autopsy can confirm a diagnosis. Thus, identification of early pathological changes is crucial to enable therapeutic interventions before major neuropathological damage occurs. As PD is a multifactorial disease where environmental and genetic factors are intricately associated, epigenetic modifications may play a major role. These changes accumulate over time, subsequently affecting gene expression. The link between aberrant DNA methylation and neurodegenerative disorders is beginning to be explored. We hypothesized global methylation status of CpG islands are different in PD patients from non-PD individuals, and a relationship to the susceptibility of PD may exist. DNA was extracted from frozen human brain cortex (superior frontal gyrus at the level of genu of the corpus callosum) from twelve PD patients and twelve controls (NL). Human brain tissues were obtained from the Banner Sun Health Institute Brain and Body Donation Program. Genome-wide DNA methylation profiling was performed using the Illumina HumanMethylation 450k BeadChip array. We identified 2,795 differentially methylated CpG sites (DMSs) between PD cases and controls with p-value < 0.01. To investigate the methylation patterns for senior cohort, differential methylation analysis between 7 senior PD (age > 80) and 7 senior NL samples was performed. We identified 1928 significant DMSs with p-value < 0.01. Majority of DMSs were hypomethylated suggesting overall hypomethylation in the brain of PD cases compared to controls. Unsupervised hierarchical clustering analysis based DMSs showed a distinct separation between PD and non-PD subjects. Overlapping analysis shows 10 most significant DMSs with $\Delta\beta \geq |0.2|$ and p-value < 0.01 between the two differential methylation analyses. A pattern of robust hypermethylation of synphilin-1, α-synuclein interacting protein (SNCAIP) gene in PD cases ($\Delta\beta = 0.60$) existed. Finally, Gene Ontology (GO) analysis and Ingenuity Pathway Analysis (IPA) were used to perform biological interpretation. Results suggest global differential DNA methylation is associated with the susceptibility of PD, and there is a link between SNCAIP methylation and PD risk. The methylation level of SNCAIP might be a good biomarker in PD diagnosis and treatment.

HECTOR NIEVES FIGUEROA

MTP PARTICIPANT 2016

I learned the hard way that some people are born with talent and others just have to work harder to achieve success in their lives. A lot of times I thought about quitting, but every time my mind betrayed me, my grandma came to the rescue. She insisted that I continue studying, that persisting was the only way I could excel where others failed. I remember how I would complain about helping her and my paraplegic uncle, and she would tell me, "He who doesn't know how to serve, doesn't know how to live." Those words influenced me so much until this day that I decided to dedicate my life to serve others through medicine, entrepreneurism, and research.

July 2011 I was accepted as an undergraduate student at Universidad Metropolitana with a full science scholarship to study cell and molecular biology. After four years, I graduated and got accepted into medical school at Ponce Health Sciences University. I will never forget my grandma's expression of joy at that moment. Now I'm on track to become a pulmonologist. I plan on treating my community with a holistic approach and to educate them so that they can achieve a healthier life.

As an undergraduate student, I researched the function of dendritic cells in the lymphoid tissue of the mouse gut. Now as a trainee in the Medical Training Program, I am working with Dr. William Langridge and Dr. Jacques Mbongue administrating a Cholera Toxin B subunit-pro insulin vaccine to human dendritic cells to identify how the vaccine upregulates the tryptophan catabolic enzyme indoleamine 2,3- dioxygenase expression during the onset and progression of type 1 diabetes. This therapy could greatly influence the way we treat type 1 diabetes and potentially other autoimmune diseases.

CTB-INS INDUCES IDO EXPRESSION INDEPENDENT OF TGFβ IN HUMAN DENDRITIC CELLS

Héctor Nieves , Grace Esebanmen, William Langridge

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

Immunological homeostasis involves a balance between immunity and tolerance which is maintained mainly by dendritic cell (DC) guidance of naïve T cell differentiation. In tissue specific autoimmune diseases, such as type 1 diabetes, differentiation of naïve T cells into pro-inflammatory T cells occurs, triggering immune responses against self-tissues. Early studies showed a chimeric fusion protein vaccine composed of proinsulin and the cholera toxin B subunit (CTB-INS) suppressed type 1 diabetes onset in the non-obese diabetic (NOD) mouse. More recent studies showed the vaccine inhibited immature human DC expression of CD80, CD86 costimulatory factors, and increased anti-inflammatory interleukin 10 (IL-10) expression. Proteomic analysis of vaccine- stimulated DCs showed a dramatic upregulation of the tryptophan catabolic enzyme indoleamine 2,3- dioxygenase (IDO1) known to be important in DC-mediated tolerance. Transforming growth factor beta (TGFβ) is known to play a role in the upregulation of IDO in mouse DCs through a Smad-dependent signal transduction pathway. In this study we assessed the role of TGFβ as an immunoregulatory cytokine in the biosynthesis of IDO1 by CTB-INS treated human monocyte derived DCs (moDCs). Based on immunoblot experiments, we found that CTB-INS treated moDCs upregulate IDO1 expression following the inhibition of biologically active TGFβ. This observation suggests that although TGFβ expression is stimulated by CTB-INS, it may not be required for upregulation of IDO1 biosynthesis in human moDCs. Thus, CTB-INS stimulation of IDO biosynthesis may occur through an alternative signaling pathway.

MARIA DE LOURDES PAGAN-MENDEZ

MTP PARTICIPANT 2016

I am a second year medical student at the University of Puerto Rico School of Medicine, who plans to one day serve the community as a medical doctor. As an undergraduate and medical student, I have been able to be part of programs that feed and take care of the basic necessities of the homeless in my country, Puerto Rico. As a future physician, I hope to help alleviate the health disparities minorities have to face each day.

Being a medical student comes with the burden of long hours of studying; therefore, to relieve the stress of med school, in my spare time I am a volleyball and ping pong player. I enjoy playing these two sports during the school year by participating in different tournaments at my school or in the tiny breaks we get after tests. In general, I am a sports enthusiast, so I enjoy spending most of my free time playing any sport.

My past research experiences include working at a genetic's laboratory mapping the genetic heritage of Puerto Ricans, working at a plant physiology and pathology laboratory performing mutations on Ricin toxin in order to find a vaccine against it, and, lastly, working at a chemistry laboratory developing ferrocene compounds attached to estrogen that will serve as a potential treatment against breast cancer.

During this summer I worked at Dr. Daisy de Leon's breast cancer laboratory under my mentor Vinodh Kumar Radhakrishnan with the help of Qianwei Tan and MD/PhD student Xousaen Helu. I am extremely grateful for their patience and guidance throughout this project which helped me acquire valuable skills and crucial knowledge for my future medical profession.

IGF2 REGULATES MITOCHONDRIAL CELL ENERGY PHENOTYPE AND BIOGENESIS IN TNBC CELLS

Maria de Pagan-Mendez, Vinodh Radhakrishnan,
Qianwei Tan, Daisy De León

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

Triple negative breast cancer (TNBC) is very aggressive, resistant to chemotherapy, and more likely to relapse, causing the worst prognosis. African American (AA) women suffer higher incidence and mortality of TNBC due to the expression of high levels of Insulin Growth Factor-II (IGF-II) which promotes tumor progression, metastasis, and chemoresistance. Also, it has been established that functional mitochondria and mitochondrial DNA (mtDNA) are essential for cancer cell growth. Mutations and/or reductions in mtDNA copy number that alter the Oxidative Phosphorylation (OXPHOS) physiology are common features of TNBC. We have demonstrated that mtDNA content is lower in CRL-2335 AA TNBC cell line when compared to the CRL-2335 IGF-II knockout cell line. Thus, we propose that IGF-II regulates the mtDNA content. This study was designed to demonstrate if IGF-II regulates mitochondrial genes to determine the cell energy phenotype. An XFp analyzer was used to study the mitochondrial function in terms of Oxygen Consumption Rate/Mitochondrial Respiration (OCR) and Extracellular Acidification Rate/Glycolysis (ECAR) in the wild type and IGF-II stable knockout of CRL-2335 AA TNBC cells. Real Time PCR was performed to study the gene expression pattern of IGF-II, PGC1α and PGC1β. PGC1α and PGC1β, critical genes in the regulation of mitochondrial biogenesis, are important in the cellular metabolic phenotype. Utilizing the Seahorse metabolic system, we assessed cell energy phenotype and alterations in terms of mitochondrial respiration rate (OCR) percent and Glycolysis (ECAR) percent. Our preliminary results showed the overall OCR and ECAR of the stressed CRL-2335 AA TNBC cells was altered according to the levels of IGF-II expressed. Furthermore, the results demonstrated a metabolic shift in the CRL-2335 AA TNBC cells towards the glycolytic pathway when IGF-II was knockout in comparison to the wild type CRL-2335 cells. IGF-II knockout cells also showed a higher gene expression rate of PGC1β as compared to the wild type. The above data confirms that IGF-II plays a critical role in determining the cell energy phenotype.

ARSENIO REYES RIVERA

MTP PARTICIPANT 2016

Usually, people remember my name by thinking about the poisonous element arsenic. I can understand that because there are few people I know sharing the same name as mine: my grandfather, my father and the Hollywood star Arsenio Hall. However, I want you to remember me as who I am, what my current goals are, and what my name truly represents.

I am an inquisitive and extremely perseverant Puerto Rican passionate about healthcare, baseball, music, Puerto Rico and family. Currently, I am a chemist graduated from UPR-RP and a second year medical student from San Juan Bautista School of Medicine. I believe that in order to reach a specific goal, several short-term goals have to be well done first.

I am guiding myself to become a physician specialized in the field of neuroscience. I intend to keep a balance in my life, take every opportunity offered and benefit from it. I aspire to be a trusted and prepared physician because seeing a patient's health improve brings rewards with it.

I am currently working in the Fig NeuroLab™ with Dr. Johnny Figueroa determining the effects of a high-fat diet and stress on heart stress genes to see if there is a relation between diet, PTSD and cardiovascular diseases. Loma Linda University, MTP, and Dr. Figueroa's lab has given me leadership, critical thinking and stronger tools to become a better physician by examining health disparities issues and by having a better sense of spirituality. I am truly grateful to be part of this laboratory and this amazing experience. Lastly, I want to acknowledge Julio Vega and Miguel Serrano for sharing their knowledge and patience with me during this summer.

CARDIOMETABOLIC ADAPTATIONS TO TRAUMA IN AN ANIMAL MODEL OF PTSD

Arsenio Reyes-Rivera, Julio Vega-Torres, Johnny Figueroa

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

Cardiovascular disease (CVD) is the leading cause of death and disability in the world. It is well established that psychological trauma increases CVD. Emerging epidemiological evidence shows that patients suffering post-traumatic stress disorder (PTSD) report high prevalence of hypertension, hyperlipidemia, and coronary heart disease. However, little is known about how PTSD impairs cardiovascular function and metabolism. We have shown that the interplay between fatty acid metabolism and stress signaling molecules may contribute to PTSD-like behaviors in a predator-scent stress (PSS) model of PTSD. The objective of this study was to determine the expression of genes implicated in the stress response (FKBP51, CRHR1, NR3C1) in the hearts of rats exposed to PSS. Real Time-Polymerase Chain Reaction (RT-PCR) revealed a significant 42.9% reduction in FK506-binding protein 51 mRNA levels in animals exposed to trauma when compared to unexposed controls (p-value = 0.024). Notably, we found that the mRNA levels of the fatty acid translocase (FAT/CD36) mRNA levels were reduced (25.0%) in the animals exposed to trauma (p-value = 0.027). This study validates a link between traumatic stress and altered fatty acid metabolism. Further, our study identifies FKBP51 and CD36 as potential biological factors that may predispose the heart to CVD following traumatic stress.

Initiative to maximize Student Development (IMSD)

Ivana Alicea-Polanco
Christina Cajigas-Du Ross
Katherine Concepcion
Alfonso Duran
Xousaen Helu
Jenniffer Licero-Campbel
Richard Lindsey
Shanalee Martinez
Karina Mayagoitia
Manuel Montero
Hiel Rutanhira
Nick Sanchez
Miguel Serrano
Julio Vega
Leanne Woods-Burnham

IVANA ALICEA-POLANCO

IMSD PARTICIPANT 2016

My curiosity and adventurous personality as a child indicated my innate love for science, but it wasn't until my teenage years when that passion developed further. I was 14 when my grandfather had a stroke, and it changed my life beyond my own comprehension. I was encouraged to research his condition, and this investigation made me passionate about neuroscience and its mysteries.

While in college studying biology in Puerto Rico, I was introduced to biomedical research through Dr. Carlos Casiano who visited my university. He encouraged me to apply to the Undergraduate Training Program (UTP), and I was given the opportunity to participate in summer 2014 under the mentorship of Leslimar Rios in Dr. Casiano's lab. With their help, I was able to understand what it took to be a biomedical researcher and determine that I wanted to do it for the rest of my life.

I am now a graduate student in the physiology department under Dr. Johnny Figueroa's mentorship and alongside my colleagues Julio Vega and Dr. Priya Kalyan-Masih. My current research interest is the connection between nutrition and neurological disorders such as PTSD and mTBI. I aspire to use biomedical research to make a difference in people's health and choices.

DIETARY OMEGA-3 POLYUNSATURATED FATTY ACIDS AMELIORATE PTSD-LIKE BEHAVIORS WHILE IMPROVING HIPPOCAMPAL MORPHOLOGY FOLLOWING MILD TRAUMATIC BRAIN INJURY IN RATS

Ivana Alicea-Polanco, Andre Obenaus, Elizabeth Haddad, Priya Kalyan-Masih, Julio Vega-Torres, Eli Kinney-Lang, Marino De Leon, Johnny Figueroa

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

There is now substantial evidence that mild traumatic brain injury (mTBI) increases the risk of developing post-traumatic stress disorder (PTSD). Although the mechanisms by which risk of PTSD may be increased following mTBI remain unclear, it has been hypothesized that the activation of stress-signaling pathways in the injured hippocampus may lead to PTSD. Thus, therapies that reduce the hippocampal stress responses may promote neural repair and reduce the risk for developing PTSD. The present study: (1) examines the prophylactic efficacy of n-3 PUFAs to ameliorate PTSD-like behaviors following controlled cortical impact (CCI)-induced mTBI (0.5 mm depth) in adult rats; (2) evaluates the impact of dietary n-3 PUFAs on hippocampal volume following chronic mTBI; (3) investigates the impact of dietary n-3 PUFAs on hippocampal glucocorticoid-mediated stress signaling. Rats were fed with either control or n-3 PUFA-enriched diets for 4 weeks before being subjected to mTBI. Behavioral analyses were performed at 2, 4, and 8 weeks post-mTBI. The animals were allowed to survive for 8 weeks after trauma and the brains collected for high-resolution magnetic resonance imaging (MRI). We found that consumption of n-3 PUFA significantly reduced hyperarousal responses, a hallmark behavioral cluster associated with PTSD. MRI data demonstrated that dietary n-3 PUFAs preserved hippocampal volume when compared to animals fed with the control diet ($p < 0.05$). Lastly, Western blot analyses showed a possible interplay between n-3 PUFA consumption and the stress-signaling chaperone FK506-binding protein 51 (FKBP51) levels in the hippocampus. Collectively, our study demonstrates that the pathophysiological responses associated with PTSD may be ameliorated by dietary n-3 PUFA consumption.

CHRISTINA CAJIGAS-DU ROSS

IMSD PARTICIPANT 2016

My research experience began in high school when I participated in the 2004 ABC summer program researching plant vaccines in Dr. William Langridge's lab. In 2009, I graduated with a BA in both biology and sociology from Case Western Reserve University in Cleveland, OH. As an undergraduate, I did research in plant molecular genetics studying how Linum insertion sequence-1 (*LIS-1*) contributes to gene alterations in flax (*Linum usitatissimum*) when grown in stressed-induced environments. Continuing my education at Case Western, I graduated in 2011 with an MS in Biology with a focus on plant molecular genetics. My thesis focused on the intraspecies and interspecies genetic differences between flax varieties and other species in the genus *Linum*.

Currently a PhD student in Dr. Carlos Casiano's prostate cancer laboratory, my research focuses on targeting multiple proteins involved in drug resistance including LEDGF/p75 and Clusterin. Understanding these pathways is important in discovering novel therapeutic targets for combinatorial therapies aimed at not only killing the prostate tumor but also simultaneously attenuating chemoresistance. This is especially important among the African American population, which have more aggressive prostate tumors and a higher mortality when compared to other ethnic groups.

Last summer I was on maternity leave and had a beautiful son named Clayton who has forever changed my life. I am truly blessed to be a working mom. I am an Ohio girl living in a California world; I may "Bleed Blue" (go Dodgers!), but I am forever a Cleveland CAVS fan (#ALLin216)!

I am grateful to the IMSD program and the Center for Health Disparities and Molecular Medicine for the opportunities given me and also thank my fellow laboratory members and summer student Josh for their friendship, advice, help, and support.

TAXANE-SENSITIVE AND -RESISTANT PROSTATE CANCER CELLS EXHIBIT DIFFERENCES IN THEIR MIGRATION POTENTIAL AND TRANSCRIPTOME PROFILE

Christina Cajigas-Du Ross, Joshua Ramirez, Charles Wang,
Xin Chen, Carlos Casiano

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

Prostate cancer (PCa) is the most commonly diagnosed cancer in American men and the second leading cause of male cancer deaths. PCa patients undergoing treatment often develop metastasis and castration-resistant prostate cancer (mCRPC). Our group has shown that expression of lens epithelium-derived growth factor protein of 75 kD (LEDGF/p75) is elevated in PCa cells and tissues. LEDGF/p75 is a stress transcription co-activator that protects PCa cells against death induced by chemotherapeutic agents such as the taxane drug Docetaxel (DTX). DTX is the current standard of care for patients with mCRPC; unfortunately, disease progression and chemoresistance occurs in DTX-treated patients. DTX resistance is characteristic of metastatic tumors, leading to high patient mortality. We have shown previously that targeting LEDGF/75 with small molecule inhibitors or siRNA-mediated knockdown partially re-sensitized taxane resistant PCa cells to DTX treatment. Our group and others have also established a role for LEDGF/p75 in promoting increased cancer cell proliferation and clonogenicity, leading to enhanced cell survival. In this study, we aimed to examine the migration potential of taxane-sensitive (low LEDGF/p75 expression) and –resistant (high LEDGF/p75 expression) PCa cells using an *in vitro* wound-healing assay. Taxane-resistant PCa cells showed decreased migration compared to taxane-sensitive cells. However, the opposite effect was observed in taxane-resistant cells after LEDGF/p75 knockdown, suggesting this protein may influence cell migration. In order to gain insights into molecular mechanisms underlying taxane resistance in these cells, we performed RNA-sequencing comparing transcriptome profiles in taxane-sensitive and –resistant PCa cells. Preliminary Ingenuity Pathway Analysis (IPA) of RNA sequencing data identified downregulated genes associated with cellular movement and migration in taxane-resistant PCa cells, consistent with results observed in the migration studies. Taken together, these results suggest differences in gene expression between taxane-sensitive and –resistant PCa cells may influence the migration and metastatic potential of these cells.

KATHERINE CONCEPCION

IMSD PARTICIPANT 2016

Before coming to Loma Linda, my mission was clear to me: to practice medicine at the bedside while creatively doing everything I could to eradicate disease on a larger scale. It is this passion that influenced my desire to become a physician scientist.

In my undergraduate years at University of California Berkeley, I was driven to tutor preventative medicine through the Peer Health Exchange to help target the challenges underprivileged students face. After this exposure, I rounded at Stanford while simultaneously working in a translation lab studying mechanism of lung angiogenesis in the neonatal mouse. I realized that patient care was what drove me every day, both clinically and in the lab. Since then, I have constantly been involved in translational research in a broad scope of areas. One thing has remained constant: my heightened interest for perinatal biology.

I am currently in Loma Linda University's MD/PhD dual degree program through the CHDMM department. I just finished my first two years of medical school and am excited for this transition to graduate school. I have never second guessed my mission to enter the PhD program. My hope is to bridge the gap between medical and graduate students and be a facilitator for creating research projects that directly answer clinical questions. I am currently working with Dr. Lubo Zhang in the Center for Perinatal Biology to develop an effective model to study brain ischemic injury and inflammation in neonatal rats. We are currently testing the hypothesis that after LPS exposure, rat pups can be rescued with hydrocortisone.

HYDROCORTISONE PROTECTS THE BRAIN FROM HYPOXIC-ISCHEMIC INJURY IN NEONATAL RATS

Katherine Concepcion, Yong Li, Lubo Zhang

Center for Perinatal Biology, Division of Pharmacology
School of Medicine, Loma Linda University, Loma Linda, CA

Hypoxic-ischemic encephalopathy (HIE) is a major cause of neonatal disability and mortality. Infants acquiring HIE are at risk for developing other neuronal diseases such as severe cerebral palsy, mental retardation, seizures, and other neurodevelopmental disabilities. HIE brain damage is largely due to perinatal asphyxia and hypoxia prior to or after birth. Inflammation has been shown to play a critical role in neonatal brain damage and is an important contributor to the pathogenic cascade. Inflammation can both sensitize, as seen in perinatal infections, and participate in the injury response to a hypoxic insult as well as in the recovery process after insult. In the present study, we modified a Rice-Vannucci model in rat pups to better understand the consequences of inflammation and epigenetic regulation during fetal and postnatal life. Previous studies have shown that pretreatment with dexamethasone, an anti-inflammatory steroid medication, in neonatal HI brain injury demonstrates a neuroprotective effect and decreases HI insult-induced brain infarct size. Because dexamethasone has many detrimental side effects, we explored the potential therapeutic use of hydrocortisone. The aim of this project was to develop a model to study the effects of post-HI treatment with hydrocortisone. Our results demonstrated that rat pups treated with hydrocortisone 4 hours post-HI showed a decrease in brain infarction size. We then used LPS to mimic the infections acquired in the womb or post-birth. Our results demonstrated increased HI-induced brain infarction and the mortality rate in rat pups treated with LPS. We also showed that intracerebroventricular injection of hydrocortisone significantly decreased HI-induced brain injury in the pups receiving LPS. Of importance, we demonstrated that intranasal delivery of hydrocortisone after HI insult showed a significant reduced brain infarction size. Our results suggest a potential therapeutic effect of hydrocortisone for HIE in neonates. Further studies are needed to investigate the mechanisms by which hydrocortisone acts in neuroprotection in the developing brain.

ALFONSO DURÁN

IMSD PARTICIPANT 2015

When graduating from medical school in 2010, I thought most of my academic career was over. In my second year of residency, however, I found myself somewhat disheartened with the future impact I could have on a community's health. Even though helping patients on a one-to-one basis can change their lives dramatically, changing a community's health is almost impossible, especially when dealing with chronic disease (obesity, diabetes, etc.).

After much deliberation, I elected to put residency on hold and pursue a PhD in physiology at Loma Linda University. Fortunately, Dr. Marino De Leon granted me a position in his Lab. My current research focus involves the characterization of binding affinities of several fatty acids (FA) to fatty-acid-binding-protein (FABP)-2 and 5. There is a known link between a variant of FABP2 and metabolic syndrome/diabetes. Hopefully, by the characterization of FA to FABP2, we will be able to shed light on why this link between a variant of FABP2 and diabetes exists.

Currently, the delivery of healthcare lacks a patient-centered focus and many times misses to address causative agents of disease. My future goal is to develop a comprehensive wellness center that focuses on integrative care and translational research in underserved communities. Moreover, the focus of the wellness center would be on developing new forms of healthcare delivery and formulating novel clinical research aimed at solving chronic disease.

MUTANT EPIDERMAL FATTY ACID BINDING PROTEIN 129 A RETAINS ANTIOXIDANT PROTECTIVE FUNCTION AGAINST INDUCED LIPOTOXIC INJURY

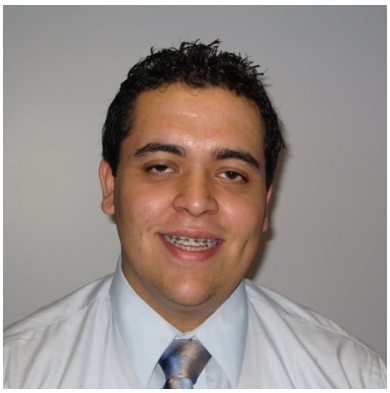
Alfonso Durán, Jo-Wen Liu, Marino De Leon

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

Epidermal fatty acid-binding protein (E-FABP/FABP5/DA11) belongs to a family of intracellular 14-15 kDa lipid-binding proteins, whose functions have been associated with fatty acid signaling, cell growth, and protection against lipotoxic injury. Notably, upregulations of E-FABP protect neuronal cells from reactive oxygen species (ROS) and cell death after palmitic acid-induced lipotoxic injury (PAM-LTx). However, the mechanism of protection from PAM-LTx remains unclear. Currently, it is believed E-FABP functions as an antioxidant protein against ROS through covalent modification of Cys-120 residue. Additionally, E-FABP could function by binding free fatty acids in the cytoplasm rendering fatty acids unavailable for lipid peroxidation. The amino acids responsible for binding of fatty acids in E-FABP binding pocket are Arg109, Arg129, and Tyr131; furthermore, Arg129 forms a salt bridge with the carboxylate group of fatty acids that may be essential for stabilizing fatty acid binding. Therefore, we sought to create a mutant E-FABP that significantly decreased binding affinity to palmitic acid and examine whether the mutant retained protection against ROS in nerve growth factor-differentiated PC12 cells (NGFDPC12 cells). Moreover, this mutant will facilitate in determining whether the antioxidant properties of E-FABP might be dependent or independent of fatty acids' binding. We hypothesize that mutant E-FABP-129A will significantly decrease binding affinity to palmitic acid while retaining antioxidant function. Isothermal titration calorimetry demonstrates that recombinant rat E-FABP-129-A clearly exhibits significantly reduced binding to palmitic acid versus wild type E-FABP. Furthermore, we found NGFDPC12 cells are protected against ROS when recombinant E-FABP-129-A is delivered by BioPORTER® QuikEase™ Protein Kit. These findings suggest that E-FABP antioxidant function is not dependent on fatty acid binding and support roles of this protein beyond functioning as intracellular fatty acid transporter.

XOUSAEN HELU

IMSD PARTICIPANT 2016



Ever since I participated in a summer research program here at Loma Linda University back in 2002, I knew I wanted to pursue a career in scientific research. As a graduate student in the MD/PhD program at LLU, I am training to attain that goal. I attended La Sierra University in Riverside, CA, and obtained my bachelor's degree in biochemistry in 2007. I had the opportunity to attend a summer research program, the Undergraduate Scholarship Program (UGSP) at the National Institute of Health (NIH), after completing my bachelor's degree. Afterwards, I joined the MD/PhD program at Loma Linda University School of Medicine in August of 2007.

My current research topic is the interaction of IGF2 and HER2 in trastuzumab-resistant breast cancer under the mentorship of Dr. Daisy De Leon. My career goals include heading my own lab and working in close collaboration with clinicians to help develop new therapies against cancer.

Outside of the lab, I enjoy watching movies with my wife, walking my dog Juno, and cooking. The IMSD program and my mentors, Drs. Marino and Daisy De Leon, have been instrumental in my development as a scientist. I appreciate their efforts and guidance, and I look forward to the time when I can help mentor and guide the next generation of scientists.

INHIBITION OF STAT3 IN PRIMARY TRASTUZUMAB-RESISTANT HER2-POSITIVE CELLS LEADS TO DECREASE CELL VIABILITY

Xousaen Helu, Daisy De Leon

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

Breast cancer is the second leading cause of cancer related death in women. Approximately, 20%-30% of breast cancer patients overexpress Human Epidermal Growth Factor Receptor 2 (HER2). HER2 Is a Tyrosine Kinase receptor involved in proliferation and survival, and its overexpression makes it a good target for patients with HER2 positive breast cancer. Trastuzumab (TRA) is a recombinant monoclonal antibody that binds HER2 receptor and inhibits its signaling. Unfortunately, clinical studies have demonstrated that 30% of patients that overexpress HER2 do not respond to Trastuzumab treatment. Therefore, understanding the molecular mechanisms underlying Trastuzumab resistance is essential to develop new therapies to treat these breast cancer patients. Previous studies in our lab demonstrated that a decrease in cell growth of HER2 overexpressing cells occurred when IGF2 and HER2 were inhibited. Nevertheless, these cells overcame the growth inhibition, and the resulting proliferative growth coincided with an increase in STAT3 activation. STAT3 is a transcription factor that promotes cell proliferation and can regulate apoptosis in cancer cells. These findings lead us to hypothesize that blocking STAT3 together with IGF2 and HER2 will inhibit proliferation and cell viability of Trastuzumab resistant breast cancer cells. We treated Trastuzumab-resistant HER2 positive JIMT1, CRL-2326, and CRL-2330 cells with HER2, IGF2, and/or STAT3 inhibitors. After 72 hours of treatment, there was a marked decrease in cell viability between the treatment groups. Cell viability was measured using WST-1, a reagent that measures mitochondrial activity. These findings suggest that in Trastuzumab-resistant HER2 positive JIMT1 cells, STAT3 activation overcomes the inhibition of the HER2 and IGF2 proliferation pathways resulting in cell death prevention. Our study demonstrates that Trastuzumab-resistant HER2 positive JIMT1 cells can activate STAT3 as an alternative pathway to evade apoptosis and promote chemoresistance. Our data also illustrate the challenge of treating cancer based on single therapies since tumors have many alternative pathways to promote growth.

JENNIFFER LICERO

IMSD PARTICIPANT 2016

My name "Jenniffer Licero" describes and encompasses the character and all the convolutions of a 26-year-old female. Quite removed from its Cornish origin and meaning of "white enchantress," Jenniffer identifies a courageous, humble, hardworking, devoted, focused and happy person. Jenniffer, a name some have correlated with the feelings bubbly and happy, is a girl who looks fearlessly into the unknown to make the known better. I like to defy the norm. An incessant questioner of paradigms and theories, I strive to unearth the unknown. I am a worshipper, God's daughter, a Christian, and Venezuelan, even while recognizing my grandparents' Colombian blood runs through my veins. I am likely in the smallest of minorities as a Christian, Hispanic, female scientist who wants to change the world, help people live better lives, defies the odds, and looks forward to challenges ahead. Ultimately, I would say I am a servant of God used to show seemingly impossible dreams are not impossible for Him.

My current challenge involves changing paradigms in the field of spinal cord injury with the help of my mentor Dr. Marino De Leon. I have, at present, voluntarily chained myself to a world of fatty acids and fatty acid binding proteins that consumes my waking and sleeping hours. This world, while fascinating, is an enjoyable black hole. In the midst of my revelry with fatty acids and their respective binding proteins, I have somehow found time to complete major class requirements for a degree in human anatomy. Having recently finalized my fourth year as a PhD student, I await the fifth in hopes I will fall within the national average for graduation and my long awaited end will, at last, lie within the realm of memory.

FUNCTIONAL CONTEXTS AND ROLES OF FATTY ACID BINDING PROTEINS 4 AND 5 IN RATS FOLLOWING SPINAL CORD INJURY

Jenniffer Licero, Miguel Serrano Illán, Kathia Cordero,
Johnny Figueroa, Marino De León

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

The pathophysiology of spinal cord injury (SCI) results from mechanical insult and resolution of injury. Studies have shown marked death of neurons and severance of axonal connections during injury onset. Neuronal cell death and membrane rupture are main causes of the observed shift in the spinal cord lipidome shown to promote differentiation of resident microglia and infiltration of peripheral inflammatory cells. Our lab and others have shown a large increase in pro-inflammatory lipids and in the ω-6: ω-3 polyunsaturated fatty acid (PUFA) ratio in injured rat spinal cord epicenters when compared to controls. Pro-inflammatory fatty acids, including ω-6, have been extensively shown to promote death of neuronal cell populations and diminish axonal reconnection. Therefore, investigating proteins involved in binding and shuttling of fatty acids is of great import when in search of improving locomotor and sensory recovery after SCI. Fatty acid binding proteins, particularly fatty acid binding protein 4(FABP4) and 5 (FABP5), have displayed therapeutic potential due to their ability to bind pro-inflammatory and anti-inflammatory lipids respectively. Our previous publications have documented the presence of FABP5 in neurons, glia, oligodendrocytes, astrocytes, and neural progenitors and its ability to promote neuronal survival and locomotor recovery through modulation of docosahexanoic acid (DHA) and eicosapentanoic acid (EPA) after spinal cord injury. Furthermore, inhibition of FABP5 was shown to hinder locomotor recovery post SCI. In contrast, unpublished data from our lab have revealed an opposing role for FABP4, whose expression is prevalent in monocytes and macrophages. Spatiotemporal studies looking at mRNA and protein levels of FABP4 in control diet rats at 1,3,7,14, and 28 days post injury revealed a marked increase of more than 100-fold mRNA and 15 fold protein differences in injured rats compared to controls at 7 and 28 days post injury particularly. Of note, inhibition of FABP4 using the BMS 309403 FABP4 inhibitor improved locomotor recovery scores for rats at all time points. Because of these distinct expression profiles and functional contexts, we hypothesize modulation of FABP5 and FABP4 expression after injury is essential in promoting locomotor and sensory recovery after SCI.

RICHARD LINDSEY

IMSD PARTICIPANT 2016

I am a fifth-year student in Loma Linda University's MD/PhD program, having completed two years of medical school and two years of the PhD program. In 2012, I graduated from Biola University with a degree in biochemistry, and I am a perpetual member of Biola's Torrey Honors Institute, a great books program taught in the Socratic style. I intend to use my education from both Biola and LLU to pursue a career in endocrinology research with an eye toward understanding and eliminating health disparities. Moreover, I am interested in Christian theology and philosophy of science, and I want to contribute both to science and to the way people perceive and relate to science. In an effort "to glorify God and to enjoy him forever" (*Westminster Shorter Catechism*), I want to ensure that Man's conquest of Nature does not become Nature's conquest of Man (CS Lewis, *The Abolition of Man*). In what little free time I have, I enjoy reading (I'm currently going through Keller's *Every Good Endeavor* and revisiting Wilson's *Notes from the Tilt-a-Whirl*) and learning statistical programming in R.

Over the years, I have participated in the UTP, MTP, and IMSD programs, and this is my seventh year presenting at the CHDMM's annual symposium. Additionally, this is my seventh summer working with Dr. Subburaman Mohan in the Musculoskeletal Disease Center at the Jerry L. Pettis VA Medical Center, and I am truly grateful for the support and learning opportunities he has given me. I have learned much from Dr. Mohan over the last year through the processes of submitting papers and presenting at conferences, and I am delighted to continue working toward my PhD in Dr. Mohan's lab.

EPIGENETIC REGULATION OF OSTEOBLAST DIFFERENTIATION BY VITAMIN C INVOLVING PROLYL HYDROXYLASE DOMAIN-CONTAINING PROTEIN 2 (PHD2)

Richard Lindsey, Shaohong Cheng, Sheila Pourteymoor, Catrina Alarcon, Subburaman Mohan

Musculoskeletal Disease Center, VA Loma Linda Healthcare System and Center for Health Disparities and Molecular Medicine, School of Medicine, Loma Linda University, Loma Linda, CA

Vitamin C (ascorbic acid, AA) is an important regulator of osteoblast (OB) differentiation, and our recent studies have provided direct evidence for the involvement of PHD2 in mediating AA effects on OBs. Due to the recent finding that AA promoted demethylation of many gene promoters via activation of ten eleven translocases (TETs) and because PHDs, like TETs, are 2-oxoglutarate-dependent dioxygenases that require AA for their activities, we hypothesized that the effects of AA on OBs are in part due to PHD2-mediated conversion of 5-methylcytosine (5-mC) to 5-hydroxymethylcytosine (5-hmC) in the promoter regions of genes involved in OB differentiation. Treatment of MC3T3-E1 and primary OBs with AA significantly increased the amount of 5-hmC as measured by dot-blot assays and ELISA. To determine if AA-induced DNA demethylation is caused by PHD2, we evaluated if PHD2 is localized in the nucleus. We found that PHD2 is localized in the nucleus as determined by immunoblot analysis and immunohistochemistry staining. Furthermore, AA treatment increased nuclear uptake of PHD2. Inhibition of PHD2 activity by a chemical inhibitor, IOX2, or knockdown of PHD2 expression blocked AA effects on hydroxylation of 5-mC. We next evaluated if AA induced demethylation of CpG sites in the promoter region of AA target genes involved in OB differentiation. We found that AA treatment of primary mouse OBs for 72 hr increased 5-hmC levels in the transcription start site region containing CpG islands of known AA target genes *Osx*, *Alp*, and *Ihh.* Furthermore, IOX2 treatment blocked demethylation of the *Osx* gene, suggesting involvement of PHD2 in this process. Based on our findings, we conclude that vitamin C promotes transcription of target genes in part by epigenetic modification of DNA involving demethylation by a PHD2-mediated mechanism in OBs and that this mechanism should be exploited towards development of anabolic therapies for osteoporosis treatment.

SHANNALEE MARTINEZ

IMSD PARTICIPANT 2016

Twelve years ago at exactly this time of year, I was in Dr. Carlos Casiano's laboratory in Mortensen Hall pipetting to the rhythm of the soundtrack to *My Best Friend's Wedding* next to then-graduate student Tracy Daniels. The wonderful company, the nonsensical but very real satisfaction of color-coded tubes arranged in color-coded trays, the constant challenge to my intellect—these things, among others, drew me into the lab and gave a home to my developing career aspirations. I returned to the lab the next summer and every summer I had available afterward.

I am now a seventh-year MD/PhD student, working to complete my PhD studies in the laboratory of Dr. Lubo Zhang in the Center for Perinatal Biology. Our lab's work focuses on understanding how a mother's health during pregnancy can influence her child's health throughout life. In particular, I am interested in how hypoxia during pregnancy can damage the developing baby's heart cells, resulting in a higher risk for the child to develop cardiovascular disease in adulthood. This notion that adult diseases may be programmed during pregnancy is relatively new in science, and it carries heavy implications for healthcare during pregnancy.

I am excited to be a part of the IMSD program and am thankful for the opportunity to train with such talented students and under the mentorship of world-class researchers. I would like to express my heartfelt gratitude to Dr. Lubo Zhang for his patience, wisdom, and adventurous spirit. His leadership has inspired many to devote their efforts to understanding fetal development and improving health for generations to come.

MIR-210 SUPPRESSES GLUCOCORTICOID RECEPTOR IN RAT CARDIOMYOCYTES IN RESPONSE TO FETAL HYPOXIA

Shannalee Martinez, Chiranjib Dasgupta, Lubo Zhang

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

Hypoxia is a common intrauterine stressor, resulting in intrauterine growth restriction and increased risk for cardiovascular disease later in life. The aim of this work was to test the hypothesis that microRNA-210 (miR-210) mediates the detrimental suppression of the glucocorticoid receptor (GR) in response to hypoxia in fetal rat cardiomyocytes. Cardiomyocytes isolated from gestational day 21 Sprague Dawley fetal rats exposed to *ex vivo* hypoxia (1% oxygen) were assessed for miR-210 levels and GR abundance. MiR-210 promoter activity and miR-210-mediated repression of GR mRNA were determined in the rat embryonic heart-derived myogenic cell line H9c2. Using a cell culture-based model of hypoxia-reoxygenation injury, we assessed the cytotoxic effects of GR suppression under hypoxic conditions. Our results indicate that hypoxia induces HIF-1α-dependent miR-210 production, as well as miR-210-mediated GR suppression, in cardiomyocytes. Furthermore, inhibition or knockdown of the GR exacerbates cell death in response to hypoxia-reoxygenation injury. Our work demonstrates that the HIF-1α-dependent miR-210-mediated suppression of the GR in fetal rat cardiomyocytes increases cell death in response to hypoxia, providing novel evidence for a possible mechanistic link between fetal hypoxia and programming of the ischemic-sensitive phenotype in the developing heart.

KARINA MAYAGOITIA

IMSD PARTICIPANT 2016

I am a native Southern Californian, raised in an Adventist household in the beautiful city of Yucaipa by two wonderful parents. I graduated from Yucaipa High School in 2010 ranked in the top ten percent of my class and graduated with honors. After high school, I attended Crafton Hills College for two years and completed my general education classes. I then transferred to Pacific Union College and graduated in 2015 with a BS in Chemistry with biochemistry emphasis. Pacific Union College is nestled in the beautiful Napa Valley mountains surrounded by beautiful and vibrant colored vineyards. In summer of 2015, I was accepted into the IMSD/PhD program at Loma Linda University. I have completed my first year in the PhD program and look forward to starting my second year.

I'm extremely privileged to be working in an Alzheimer's disease research laboratory under the leadership of Dr. Salvador Soriano and Dr. Brendan Gongol. The lab studies the role amyloid plays in an adaptive response against cholesterol dysregulation and how the outcome of the response can lead to progression of Alzheimer's disease.

In my free time, I enjoy jogging and kickboxing. I have always had the curiosity of learning a martial art, so I am slowly learning Muay Thai. Exercise is my way of taking a break from the science world and getting reenergized to work even harder in the lab. I also enjoy volunteering in Vacation Bible School at my church, Calimesa Seventh-day Adventist Church.

I have a passion for research, and my hope is to one day have my own lab studying neurodegenerative diseases. I know with God on my side great things are yet to come as I begin my career as a scientist.

THE EFECT OF ATHEROGENIC FLOW WITHIN THE CEREBRAL VASCULATURE ON NEURONAL HEALTH

Karina Mayagoitia, Brendan Gongol, Salvador Soriano

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

Affecting 1 in 8 people 65 and older, late-onset Alzheimer's Disease (AD) is the most common form of dementia in the United States. Yet, despite intense research efforts, the etiology of AD is unknown, and there is no available treatment. Epidemiological studies suggest common pathogenic triggers between atherosclerosis and AD. Currently, there is growing evidence demonstrating that the endothelial dysfunction precipitated by disturbed blood flow patterns in curvatures and bifurcations underlies the pathogenesis of atherosclerosis. However, the influence it has on AD is unknown. No biological models are available to study how hemodynamic alterations in specific arterial regions may impact those pathogenic mechanisms. Here, we aim to generate such a hemodynamics model by developing a three-layered endothelial cell-astrocyte-neuron *in vitro* model of blood brain barrier (BBB) homeostasis to explore the mechanisms by which abnormal blood flow patterns may affect neuronal function. We hypothesize that exposure of endothelial cells to turbulent flow will create oxidative and inflammatory signaling molecules that will cross the BBB and affect neuronal homeostasis. To test our hypothesis, we will carry out RNA-seq in neurons taken from our *in vitro* hemodynamic BBB model. Bioinformatics will be used to analyze the data and predict novel mechanisms involved in neuronal homeostasis. Upon completion of this proposal, we will have developed a novel and innovative method that can be utilized to explore and analyze the mechanisms connecting vascular disease and AD.

MANUEL MONTERO

IMSD PARTICIPANT 2016

Without any reservation or hesitation, I can say there is no better place for genius and creativity than doing research with the IMSD program at Loma Linda University. The experience is so complete that you will be prepared for any challenge you may have in your academic and professional career. From writing scientific papers to mastering research techniques to understanding the politics and policies of the social environment where we live today, it's a full experience. For me, this has been the best intellectual enterprise I ever had not only learning from the staff in the lab, but mentoring undergraduate and high school students every summer. More important has been to work directly under Dr. Marino De Leon; he is a mentor to follow.

I am finishing the PhD program this summer and will be moving back to the clinical part of my training. I discovered some cellular death processes key to understanding how cells under stress can be recovered and preserved from fatty acid and hypoxia injury. On the other hand, I also discovered that by inducing a basal metabolic process called autophagy, you can help to rescue cells from lipotoxicity and hypoxia. This is really important because DHA, a poly unsaturated fatty acid, has the capacity to induce autophagy and to preserve neuronal cell from injury. With some diet modification DHA can easily be increased in our bodies.

I'll be publishing this exciting data and looking forward to seeing how the knowledge contributed to science might help somebody one day. I visualize myself as a clinician integrating what I see in my patients with the research done at the lab. Whatever is ahead of me I know will be exciting, God already has a plan for me, and it will be great.

INHIBITION OF PALMITIC ACID-INDUCED CELL DEATH BY BLOCKING APOPTOSIS, NECROPTOSIS AND INDUCING AUTOPHAGY

Manuel Montero, Jo-Wen Liu, Marino De Leon

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

Lipotoxicity (LTx) is triggered by lipid overload that leads to oxidative stress, cellular dysfunction and cell death. Nerve growth factor differentiated pheochromocytoma 12 (NGFDPC12) cells serve as a neuronal model to study this process. Autophagy is a survival mechanism induced by starvation, growth factor deprivation, hypoxia and oxidative stress by which the cell rids itself of protein aggregates, oxidized lipids, carbohydrates, and even dysfunctional organelles with the intent to maintain adequate energy levels contributing to cellular homeostasis. Palmitic Acid (PA, a saturated fatty acid) induces cell death mainly by apoptosis, but when apoptosis is inhibited by caspases inhibitor, cell death still goes on in a caspase independent manner known as necroptosis. In this study, we found that PA-LTx also decreased the expression and activation of the vesicle docking protein LC3 (Atg8) crucial for autophagosome formation during autophagy. Therefore, using a caspase inhibitor, ZVAD-fmk, in conjunction to a necroptosis inhibitor, Necrostatin-1, and an autophagy inducer, Rapamycin, we are able to increase cell viability during PA-LTx. The apoptotic and necroptotic processes can be measured using the split pattern of nuclear proteins Topoisomerase I (Topo I, 100kDa) and Poly (ADP-ribose) polymerase (PARP, 110kDa) by Western blots. Our laboratory has also demonstrated that docosahexaenoic acid (DHA) reverses PA-LTx-induced cell death in NGFDPC12 cells. Our results show DHA inhibits caspases activation and the 70kDa and 85kDa split products of Topo I and PARP, respectively. Moreover, DHA activated the autophagy cascade. We found increase mRNA levels of autophagy related genes like Atg7 and Atg12. Also DHA increased the active form of LC3 as measured by Western blot. Our data suggest DHA rescuing of PA-LTx-induced cell death is through inhibition of apoptosis and necroptosis. At the same time induction of autophagy gives the cell the capacity to cope with excess formation of ROS, lipid peroxidation, and protein malfunction and provides energy sources for ATP formation.

HIEL RUTANHIRA

IMSD PARTICIPANT 2016

I am currently a third year PhD student in Dr. Hansel Fletcher's lab in the Department of Microbiology and Molecular Genetics and a member of the LLU IMSD program. Our lab's research is centered on periodontal disease and key microbes, *Porphyromonas gingivalis* and *Filifactor alocis*, that potentiate disease progression. My interest in microbiology began my sophomore year at Southern Adventist University where I did a year of research which led me down this career path. Prior to Southern Adventist University, I attended Mount Vernon Academy in Ohio, and there Mrs. C, my science teacher, made me fall in love with biology. This love for biology led me to major in biology with biomedical emphasis. I was born in Zimbabwe, Africa, and my parents brought us to the United States for a better education. This move forced me to always be focused on school.

During my time at Southern Adventist University, I was inducted into the Tri Beta Biological National Honor Society which piqued my interests in other areas of biology besides medicine. Upon acceptance into Loma Linda, I began working in the lab of Dr. Fletcher where I was partnered with Dr. Yuetan Dou. Dr. Dou has been pivotal to all the knowledge I have gained since the start of my program. I am working on a project titled The Role of Putative Membrane Transporters in Regulation of Virulence in *Porphyromonas gingivalis*. My short term goal is to have my first publication within the next year.

When I'm not in the lab, you will find me at the gym or playing sports. My brothers have blessed me with nieces and nephews. Although now my mom expects more from me, I tell her I'm married to the lab at the moment, and she'll have to wait.

THE ROLE OF PUTATIVE MEMBRANE TRANSPORTERS IN REGULATION OF VIRULENCE IN *PORPHYROMONAS GINGIVALIS*

Hiel Rutanhira, Yuetan Dou, Hansel Fletcher

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

Periodontal disease presents with chronic inflammation, bone destruction, and loss of the supporting structures of the teeth. *Porphyromonas gingivalis*, a Gram-negative anaerobic bacterium, is a periodontal pathogen that can act in synergy with other oral microbes. The survival of *P. gingivalis* in the periodontal pocket requires a mechanism(s) to overcome oxidative stress in addition to other environmental changes. Extracytoplasmic function sigma factors (ECF) are known to play a role in adaptation to environmental conditions via transcriptional regulation. PG1660, a *P. gingivalis* ECF sigma factor, has been implicated in post-transcriptional regulation of gingipains, a major virulence factor. In *silico* association of PG1660 with the PG1662-PG1663-PG1664-PG1665-PG1666-PG1667 gene cluster, which carries putative ABC and RND transporters, suggests that together they may be part of cell-surface signaling (CSS) systems for adaptation in *P. gingivalis*. This gene cluster was further characterized to evaluate its role in response to environmental stress and adaptation in *P. gingivalis*. Isogenic mutants FLL500 (ΔPG1662-PG1665) and FLL501 (ΔPG1666-PG1667) defective in these genes were created by allelic exchange mutagenesis using *ermF* cassette. Similar to the wild-type strain, all mutants formed black-pigmented colonies on blood agar plates. The growth for FLL501 was similar to the wild-type in contrast to FLL500 which had a longer generation time. FLL500 showed increased sensitivity to oxidative stress compared to FLL501 and the parent strain in both Brain Heart Infusion media and Tryptic Soy Broth. While there was a significant decrease in gingipain activity in both isogenic mutants compared to the wild-type, FLL501 showed a decrease only in Rgp activity. Results for the electrophoretic mobility shift assay showed the recombinant PG1660 ECF sigma factor protein can bind the PG1662 promoter. Collectively, our observations suggest the PG1662-PG1663-PG1664-PG1665-PG1666-PG1667 gene cluster may play a role in virulence regulation and stress adaptation in *P. gingivalis*.

NICHOLAS SANCHEZ

IMSD PARTICIPANT 2016

After earning my bachelor's degree in medical biology from the University of California, Riverside, I was fortunate enough to be afforded the opportunity to continue my education through this institution. As a PhD student at Loma Linda University, I have been acquiring the skills necessary to succeed in pursuing a career in research science. During my time here at LLU, I have been working in Dr. Wolff Kirsch's lab on a breadth of projects spanning several disciplines, concentrating my efforts on the pathogenesis of neurodegenerative diseases, although I have been involved in other projects involving treating superficial bladder cancer and looking for biomarkers for schizophrenia. My work focuses on copper dysregulation and its involvement in the onset of dementia and how its transport mechanism can lead to the development of Alzheimer's disease. Working in such a contested field where each idea is hotly debated and scrutinized is challenging, yet it brings its own excitement from being in a dynamic environment.

Outside of academia, I find serenity in long distance running. There's no feeling like the one possessed after having conquered a marathon or a tough trail. Along with everything else in my life, I feel quite fortunate how I am surrounded with friends and family who provide support and to be in an institution that allows me to thrive.

DETERMINATION OF COPPER TRANSPORT PROTEIN P62 AS A SIGNIFICANT CONTRIBUTOR TO ALZHEIMER'S DISEASE PATHOLOGY

Nicholas Sanchez, Edwin Torres, Kristy Howard, Wolff Kirsch

Neurosurgery Center for Research, Training and Education, Department of Biochemistry, School of Medicine, Loma Linda University, Loma Linda, CA

The increasing prevalence for Alzheimer's disease (AD) is a rising public health issue as the extravagant costs of health care for affected patients is only growing. Controversy is maintained over the legacy paradigm concerning amyloid-beta being the fundamental genesis of AD. A growing literature describes the onset of oxidative stress playing an important role in the pathology of the disease, particularly involving metal transport pathways. Brain tissue collected from AD-affected patients has shown increased deposits of copper (Cu), providing reason to believe that the Cu transport system, particularly dynactin and its subunit p62, plays a role in the formation of this disease. We hypothesize in an AD-affected patient, p62 degrades over time leading to a breakdown in Cu transport and the emergence of AD pathology, thereby enabling its possible use as a biomarker. For this study, p62 is knocked out using siRNA transfection in SH-SY5Y neuroblastoma cells. The cells will be stained with a copper-specific histological probe CTAP-2. We will then use additional fluorescent tags to look at the effect on other proteins of the copper transport system, including precinilin-1, ATP7B, tau and amyloid-beta. Human brain samples will be tested for p62 expression and checked for correlations regarding copper deposition using histological stains and immunoprecipitation. Our previous research regarding copper deposition in AD-affected brains shows promise for this series of experiments.

MIGUEL A. SERRANO ILLÁN

IMSD PARTICIPANT 2016

If you're reading this, here's a literary high five for your willingness to take the time. Things you might want to know about me include the fact that homemade cookies are a passion of mine. I also enjoy science, I always have. While a kid growing up in Mexico, I used to dream of growing up to become a mad scientist, a radio talk show host, or a baker. Fortunately for my mother, I ended up choosing the first option (and, yes, it does take a little madness to be in school for this long).

In this paragraph I am supposed to write about my awards. I do not mean to toot my own horn, but one of my most cherished awards during my short tenure through this world is the prestigious "best uncle award" given me by my two nieces. Apparently, they appreciate bad puns and goofy faces, two of my spiritual gifts.

My childhood dreams have evolved a bit, and to those dreams I've now added other dreams, like becoming a physician and using my hands to touch lives in a non-creepy way. In 2008, I witnessed how that dream began to crystallize as I was accepted into the MD/PhD program at Loma Linda University. This year marks the end of my term as a PhD student, and next year I hope to start learning a few things about doctoring while attending medical school at Loma Linda as well.

Lastly, I dream of one day using my scientific, medical, and superb uncle skills to influence the next generations of young people to use their own talents and gifts to the benefit of others and to make this world a little richer both in knowledge and in kindness.

DHA PROMOTES SURVIVAL IN SCHWANN CELLS FOLLOWING LIPOTOXICITY AND THIS EVENT IS CORRELATED TO PMP22 REGULATION

Miguel Serrano Illán, Magda Descorbeth, Johnny Figueroa, Marino De Leon

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We have recently shown that spinal cord injury (SCI) induces systemic metabolic disturbances, including hyperglycemia, and lipid accumulation, otherwise known as lipotoxicity. These disturbances in turn adversely affect SCs and, consequently, myelination. Peripheral myelin proteins play a crucial role in myelin formation and maintenance. Moreover, Peripheral Myelin Protein 22 (PMP22) has been suggested to contribute to the regulation SC proliferation and cell death. In this study we show long-chain fatty acids have differential effects on Schwann cell survival *in vitro*: Palmitic acid (PA) induces cell death whereas docosahexaenoic acid (DHA) promotes survival. Consequently, we hypothesized PMP22 is regulated by DHA to play a neuroprotective role in lipotoxicity. Thus, our present study seeks to characterize the expression of PMP22 and its effects on cell proliferation and survival both *in vivo* and *in vitro*.

Analysis using quantitative real time polymerase chain reaction (RT-PCR) following *in vitro* treatment with PA and albumin at a 2:1 ratio (300:150uM) showed a significant upregulation in PM22 48 hours post treatment. DHA and PA (300:50uM) co-treatment resulted in restoration of PMP22 mRNA levels. Furthermore, DHA treatment with BSA (50:150uM) induced the downregulation of PMP22 at 48 hours post treatment. Lastly, cell count increased following DHA treatment, suggesting increased proliferation.

In vivo experiments involved the use of sciatic nerves from Sprague-Dawley rats on diets rich in omega-3 fatty acids or rich in omega-6 fatty acids for 60 days before undergoing contusive SCI or a spinal cord laminectomy (sham). PCR and Western blot analyses showed a significant downregulation of PMP22 in rats on the omega-3 PUFA diet, directly correlating to pain measurements as well as nerve conduction studies. Taken together, these data suggest DHA confers neuroprotection in the event of lipotoxicity, and this is positively correlated with the downregulation of PMP22 both *in vitro* and *in vivo*.

JULIO DAVID VEGA-TORRES

IMSD PARTICIPANT 2016

It was July 2012 when I left home, Puerto Rico, to come to Loma Linda with the desire of conducting my graduate studies at LLU. My wife started medical school while I waited for acceptance to graduate school. In 2013 I was accepted and am currently a graduate student pursuing a PhD in physiology with an emphasis on health disparities among psychological disorders such as post-traumatic stress disorder (PTSD). My main interest is to understand the implications that nutrition has on stress, fear, and brain circuitry. More importantly, my long-term goal is to be an important part in improving the quality of psychological disorders management and addressing mental health disparities in at-risk populations.

I have the privilege of being part of Dr. Johnny Figueroa's laboratory. The lab has been blessed with the contributions of Dr. Priyah Kalyan-Masih and Mariana Garido. This summer we have three students: Sabrina, Mina and Arsenio. Their enthusiasm for research motivates me to be their best science coach.

Besides being in the lab, I love spending time with my wife, playing the saxophone, and training for mountain bike races. I thank God for the opportunity of being part of LLU and, most important, the Center for Health Disparities and Molecular Medicine. "To learn science through human interpretation alone is to obtain a false education, but to learn of God and Christ is to learn the science of heaven," says Ellen White.

PSYCHOLOGICAL TRAUMA IMPAIRS FEAR AND ANXIETY-RELATED BEHAVIORS IN AN ANIMAL MODEL OF PTSD

Julio Vega-Torres, Priya Kalyan-Masih, Johnny Figueroa

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

Posttraumatic stress disorder (PTSD) is a debilitating psychiatric condition caused by a traumatic experience. PTSD patients suffer from traumatic flashbacks, nightmares, and persistent fear and anxiety. It is known that alterations in fear learning mechanisms are critical for the development of PTSD. However, preclinical studies investigating how traumatic experiences affect fear learning are lacking. This study was designed to investigate how traumatic stress alters fear-like behaviors in a well-established predatory-odor stress (PS) model of PTSD. Lewis rats were subjected to a PS that mimics a type of traumatic stress that leads to PTSD in humans. Fear acquisition (learning) and extinction (unlearning) behaviors were assessed for one week following PS using the fear-potentiated startle (FPS) paradigm. The elevated plus maze (EPM) was used to assess anxiety-like behaviors at nine days post-PS. The brain hippocampal formation was isolated for Western blot analyses following behavioral testing. We found that animals exposed to the PS exhibited significant fear acquisition and showed anxiety-like behaviors when compared to the unexposed group ($p < 0.05$). Exposure to PS did not alter fear extinction. The increased fear acquisition was associated with alterations in corticosterone (CORT) metabolism and signaling. In particular, we found blunted CORT responses following the conditioned FPS paradigm and reduced hippocampal levels of the CORT signaling chaperone, FK506-binding protein 51 (FKBP51). Together, our data demonstrates that PS exposure alters fear-related behaviors and substrates, thus providing a useful model for elucidating fear learning mechanisms and investigating needed treatments for PTSD.

LEANNE WOODS-BURNHAM

IMSD PARTICIPANT 2016

I am working towards a PhD in physiology focusing on health disparities among Black men with prostate cancer. My background has motivated me for several reasons. First of all, my father is a Black man with prostate cancer. Secondly, I lived in an underprivileged area of Akron, OH, for most of my life and grew frustrated with the health disadvantages I observed. As an undergraduate at the University of Akron, I explored these issues. I interned at Cleveland Clinic and witnessed health disparities among minority male patients while also conducting cancer biology research.

Since attending LLU, my research has been translational within Dr. Casiano's lab. My project focuses on the contribution of the biological stress response, which occurs frequently in Black men, to increased prostate cancer tumor aggressiveness. I have enjoyed my summer students, Kwame and Evelyn, contributing their enthusiasm to my project.

While I have been passionate about cancer research in general, I unexpectedly and personally battled (and beat) Stage 4 Hodgkin's lymphoma this past year. I owe my recovery to God, my husband, son Antonio, extended family, LLU family, and best friends Christina and Lesli (and babies Clayton and Adeline) who took care of me and cheered me up when my life stopped but the world kept going. Because of this experience, I look at cancer research in a new light.

I am happy to be back in the lab, but when not at school, I live life to the fullest, play hard, and cheer for the Cavs no matter what (clearly it paid off…#AllIn216). After all, you can take the girl out of Ohio, but you can't take Ohio out of the girl!

GLUCOCORTICOID-MEDIATED UPREGULATION OF STRESS ONCOPROTEIN LEDGF/p75: IMPLICATIONS FOR PROSTATE CANCER HEALTH DISPARITIES

Leanne Woods-Burnham, Kwame Amponsah, Evelyn Sanchez, Christina Cajigas-Du Ross, Arthur Love, Anamika Basu, Susanne Montgomery, Colwick Wilson, Carlos Casiano

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

The role of glucocorticoid receptor (GR) signaling in prostate cancer (PCa) progression is under intense investigation. While palliative therapy with synthetic glucocorticoids is administered to PCa patients undergoing androgen deprivation treatment or chemotherapy, increased GR expression in these patients correlates with worse prognosis. In addition, patients with aggressive PCa have higher serum levels of endogenous glucocorticoid (cortisol) than patients with early stage PCa. The emerging role of glucocorticoid-driven PCa aggressiveness is especially problematic for African American (AA) men, as previous studies have demonstrated chronically elevated serum cortisol levels and increased PCa aggressiveness in AA men compared to European American (EA) men. However, the molecular mechanisms underlying GR-mediated PCa aggressiveness are not clearly understood. We hypothesize that GR signaling in PCa cells may activate stress pathways underlying chemotherapy resistance and may disproportionately operate in AA men. We evaluated the effects of GR activation on the expression of the stress oncoprotein LEDGF/p75, implicated in chemotherapy resistance in PCa cells. We exposed a racially diverse panel of PCa cell lines (MDA-PCa-2b, 22Rv1, PC3, and DU145) to physiological concentrations of cortisol or dexamethasone (synthetic glucocorticoid) for up to 48 hrs and observed by Western blotting the upregulation of GR and LEDGF/p75 in treated cells. Results were quantified using Image Studio™ and t-test statistical analysis. Co-treatment of cells with GR antagonist mifepristone attenuated glucocorticoid-induced LEDGF/p75. In addition, silencing of LEDGF/p75 in PC3 cells decreased GR expression, suggesting a functional interplay between these two proteins. Furthermore, we quantified by ELISA the serum levels of LEDGF/p75 in PCa patients and observed higher levels in AA PCa patients compared to EA patients and controls. These studies represent a first step in elucidating the contribution of GR signaling to activation of the LEDGF/p75 chemotherapy resistance pathway in PCa, particularly in the context of PCa racial disparities.

School of Behavioral Health

Abigail Alido
Harindar Kaur
Joshua Nwosu
Lelah Villalpando

ABIGAIL ALIDO

SCHOOL OF BEHAVIORAL HEALTH PARTICIPANT 2016

I am a second year Clinical Psychology PsyD student at Loma Linda University. I completed my undergraduate career at UC Berkeley in 2013, receiving my BA in Psychology with a minor in education. As an undergraduate, I received research assistantships examining ADHD interventions under Dr. Stephen Hinshaw and young children rule understanding with Dr. Audun Dahl, both of whom sparked my interest in research. My most rewarding experience at Berkeley was working at a rehabilitation clinic for homeless individuals, learning about their struggles, drive to overcome adversity, and manage their mental health issues. After graduating, I was a research assistant at UC Irvine on a team examining student outcomes in funded afterschool programs under Dr. Deborah Vandell. Currently, I research adolescents with suicidal and self-harming behavior in Stage 2 Outpatient Adolescent Recovery (SOAR) lab under Dr. Rebecca Ballinger in addition to adults with binge eating disorder in the Body Image and Eating Behaviors lab under Dr. Sylvia Herbozo.

I ultimately hope to work with children and adolescents and am eager to provide mental health services to underserved populations, specifically working with emotion dysregulation and coping mechanisms. I find inspiration from this Sophocles' quote: "It is the task of a good man to help those in misfortune."

I am grateful for everything learned through research and hope to translate it to my clinical practice. I greatly appreciate the guidance and support from Drs. Susanne Montgomery, Sigrid James, and Rebecca Ballinger for providing guidance and education in researching the SOAR program.

PREDICTORS OF DROPOUT AMONG SUICIDAL ADOLESCENTS IN GROUP THERAPY

Abigail Alido, Lelah Villalpando, Bethany Clayton, Rebecca Ballinger, Kimberly Freeman, Susanne Montgomery, Sigrid James

Behavioral Health Institute, Loma Linda University, Loma Linda, CA

Dialectical Behavior Therapy for Adolescents (DBT-A) was designed to target suicidal ideation and self-harming behaviors. The Behavioral Medical Center at Loma Linda University houses a Stage 1 DBT-A intensive outpatient program (IOP) for adolescents. While showing significant improvement, adolescent graduates continued to experience distressing emotional and behavioral difficulties and expressed a need for additional services. A Stage 2 Outpatient Adolescent Recovery (SOAR) program was delivered to Stage 1 graduates to address reported emotional and behavioral difficulty and the maintenance of DBT skills. Despite youth interest in SOAR, we had over a 50% dropout rate. The aim of this study is to examine factors involved in treatment dropout. This mixed methods study uses grounded theory to analyze data from qualitative interviews and self-report measures. Participants included 46 adolescents enrolled in SOAR during the pilot stage and a small randomized control pilot study comparing SOAR to cognitive behavioral therapy (CBT). We found that the overall dropout rate was 54.3% with no significant differences between SOAR and CBT or between time since graduation from Stage 1 treatment. To examine if demographic and functional factors predict dropout in SOAR we conducted chi-squared tests and analysis of variance tests and found that demographic factors, treatment group, and being in the clinical range of distress were not significantly associated with dropout. Increased emotional disturbance at the start of SOAR predicted higher rates of program completion ($p < .05$). While increased social problems (e.g., substance abuse and sexual behaviors) and behavior dysfunction (e.g., difficulty managing behaviors and impulsivity) at the end of Stage 1 predicted dropout ($p < .05$). Additionally, adolescents and their parents reported through clinical interviews that SOAR aided in increasing emotional stability, distress tolerance, and interpersonal relations. These results indicate that addressing social problems and behavior dysfunction at the beginning of SOAR could help improve dropout rate.

HARINDER KAUR

SCHOOL OF BEHAVIORAL HEALTH PARTICIPANT 2016

After graduating from medical school (Government Medical College Patiala, India) and working as a general practitioner in India for a couple of years, I moved to California to be with my family. I knew I wanted to pursue residency training in psychiatry because of the power in psychiatry's ability to restore a sound mind and make considerable changes in a person's life. Over the past year and half, I had the opportunity to shadow and train at Loma Linda University under Dr. Serafin Lalas, Dr. Irene Ciovica and Dr. Peggy Chatham both in the inpatient psychiatry unit and outpatient clinic. Evaluating the emotional needs and easing and comforting the suffering of behaviorally, emotionally, and mentally disturbed children and adolescents gave me contentment.

As my observership ended, I came across another great opportunity to be part of the research team at Loma Linda Behavioral Health Institute headed by Dr. Susanne Montgomery to study the use of Dialectical Behavioral Therapy in Adolescents (DBT-A) in Stage 2 Outpatient Adolescent Recovery (SOAR) program for self-harming adolescents. It felt like an extension of what I had been doing earlier, and I could not resist volunteering on the research team. Another project that grabbed my attention and am currently working on is "stillbirth and related depression in women and their family members" with Dr. Montgomery and Dr. Lisa Roberts.

I consider myself really fortunate and am grateful both personally and professionally for all I have achieved so far in life. It feels great to be able to give back to the community in some way or another. I believe the least I could do to give back is to contribute my time, dedication and knowledge by volunteering in the research program at Loma Linda University.

STILLBIRTH AND ATTITUDES OF INDIAN MEN TOWARDS WOMEN

Harinder pal Kaur, Lisa Roberts, Susanne Montgomery

School of Behavioral Health, School of Nursing, Loma Linda University, Loma Linda, CA

In 2015, 2.6 million stillbirths occurred globally. India has the highest number of stillbirths in the world and in Chhattisgarh stillbirth rates are 64-103/1000 live births. In the Indian context, where a male dominated perspective is the norm, women are expected to ignore stillbirth and not express grief, yet studies have shown that women experience grief even 20 years after the event. This study was done to understand the Indian male perspective about grief and stillbirth**.** Trained interviewers conducted cross-sectional structured interviews with 28 men from 2 villages. Descriptive and bivariate analysis was conducted using SPSS version 22. 18 out of the 28 men, ages 26-46, reported that their wives experienced stillbirths; for them the average time since stillbirth was 6 years; most stillbirths occurred in participant's home (83%); 72% of the stillbirths were delivered by unskilled birth attendants; and only half of the women had antenatal care during pregnancy. Comparison of male (*n*=28) and female (n=36; reported previously) perspectives regarding women's autonomy indicates that women felt less autonomy than the men described (16% vs 71% reported being allowed to go to the market without permission). Men with more traditional attitudes reported more male stillbirths; home birth vs facility birth; no antenatal care; and absence of a skilled birth attendant during the delivery. These men perceived less social support and were more likely to be perpetrators of physical and emotional abuse. Lower education was associated with physical abuse of women; women allowed to visit natal kin suffered less emotional abuse and had more social support. In a region with high stillbirth rates, men mostly held traditional views towards women. However, men with more stillbirth experiences had more egalitarian views, possibly affected by this experience. The stigma and pain of stillbirth seemed to affect men negatively, with them feeling less social support and perpetrating abuse. Interventions targeting the effects of stillbirth clearly need to target both men and women.

JOSHUA NWOSU

SCHOOL OF BEHAVIORAL HEALTH PARTICIPANT 2016

I am a third year PhD student in clinical psychology. Although born and raised in Southern California, much of my development has been influenced by my Nigerian background. In 2013, I graduated from Oakwood University, receiving my BA in psychology. I served as a task force dean and basketball coach at a boarding high school before beginning my graduate program in 2014. I've achieved several academic and extracurricular awards, but my most rewarding experiences include working with homeless, impoverished, and burdened people. I ultimately hope to be a clinical psychologist to improve emotion regulation and problem solving strategies through therapy and research, particularly for at-risk youth and young adults in an underserved minority community.

Currently, I work in the Stage 2 Outpatient Adolescent Recovery (SOAR) research lab with Drs. Rebecca Ballinger, Susanna Montgomery, Sigrid James, and Kimberly Freeman and in the Psychophysiology of Emotion and Human NeuroCognition lab with Dr. Paul Haerich. I've am a SOAR research assistant and also serve as a student therapist in the SOAR treatment program. Research can be tedious, but I enjoy the information it produces.

I have received support from mentors, professors, and family throughout the years, and I am grateful to them. I love playing basketball and interested in topics and issues related to sports, art, religion, and social justice. I aim to make each day more fulfilling than the last. As John W. Gardner said, "to sensible men, every day is a day of reckoning."

INFLUENCERS OF ADOLESCENT DEPRESSION AND STAGE 2 DBT READINESS

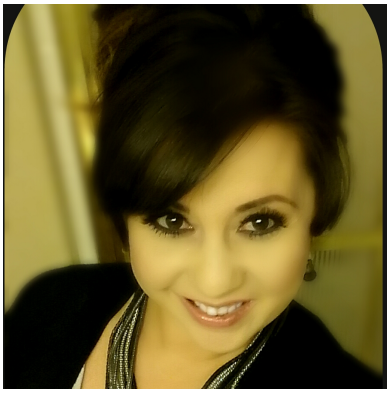
Joshua Nwosu, Shaina Herman, Rebecca Ballinger,
Kimberly Freeman, Susanne Montgomery

Behavioral Institute, Loma Linda University, Loma Linda CA

Dialectical Behavioral Therapy for Adolescents (DBT-A) is useful for adolescents with deliberate self-harm (DSH) history, many of which experience depression, low self-esteem, helplessness, relational difficulties, and school problems. It is not clear which of these experiences most contribute to depressive symptoms. The Self-Report of Personality (SRP) of the Behavior Assessment System for Children, 2nd Edition (BASC-2) was used to examine the influence of self-esteem (SE), locus of control (LOC), interpersonal relations (IR), and school problems (SP) on depression (DEP). We hypothesized that (1) all variables would significantly influence depression, (2) the strongest influence being self-esteem. Upon completion of an intensive outpatient program for adolescent DSH, 34 adolescents (M_{age} = 15.1 years, SD_{age} = 1.25 years) enrolled in a stage 2 DBT program. Prior to receiving Stage 2 treatment, patients completed the BASC-2 SRP. Baseline scores were analyzed using multiple linear regression to predict DEP through SE, LOC, IR, and SP. A standard multiple regression analysis was used to determine the influence of SE, LOC, IR, and SP on DEP among DSH youth upon completion of Stage 1 DBT. Overall, the regression model accounted for a significant proportion of the variance in DEP, Adjusted R^2 = .72, $F(4, 29) = 22.66$, $p < .001$. SE was a significant independent predictor of DEP, such that as SE increased by one unit, DEP decreased by .68 units ($p < .001$). Also, LOC was a significant independent predictor of DEP, such that as LOC increased by one unit, DEP increased by .32 units ($p < .05$). IR and SP were not significant individual predictors of DEP ($p > .05$, respectively). Furthermore, in qualitative interviews, parents and children reported needing continued therapy, but reported having mixed feelings regarding readiness for Stage 2. These findings suggest the importance of assessing Stage 2 readiness prior to treatment, as well as the possible benefits of a therapy that validates the esteem of the individual and challenges maladaptive locus of control beliefs.

LELAH VILLALPANDO

SCHOOL OF BEHAVIORAL HEALTH PARTICIPANT 2016



In 2011, I earned a Bachelor of Arts in Christian Counseling from Nazarene Bible College, and in 2015, I earned a Master of Arts in Industrial and Organizational Psychology from Argosy University. Currently, I am a second year PhD student in clinical psychology. Over the past year I have had the privilege of working within the Hartman Behavioral Neuroscience Lab conducting research under Dr. Richard Hartman. I was awarded the 2016 Loma Linda Department of Psychology Student Research Grant to pursue my thesis research: "Dietary supplementation with polyphenols as a neuroprotective therapy to reduce behavioral deficits associated with exposure to radiation early in life." Deeply grateful for the support and guidance of Dr. Hartman, I have confidence under his teaching, I will develop strong research skills and proficient practical abilities in neuroscience.

Currently, I work at Loma Linda University Medical Center's (LLUMC) Behavioral Health Institute as a research technician and clinical interviewer for the Stage 2 Outpatient Adolescent Recovery (SOAR) lab under the supervision of Dr. Rebecca Ballinger. Our research focuses on collecting, coding, analyzing, and interpreting data using a mixed methods approach to direct clinical intervention improvements to the SOAR program and better meet the needs of adolescents who self-harm and/or have suicidal ideation. Working in this lab allows me to use my forensic interviewing skills gained as a licensed child protective social worker for the State of Maine. This summer program has given me great pride in being part of the compassionate work done by LLUMC.

PREDICTORS OF DROPOUT AMONG SUICIDAL ADOLESCENTS IN GROUP THERAPY

Lelah Villalpando, Abigail Alido, Bethany Clayton, Rebecca Ballinger, Kimberly Freeman, Susanne Montgomery, Sigrid James

Behavioral Health Institute, Loma Linda University, Loma Linda, CA

Dialectical Behavior Therapy for Adolescents (DBT-A) was designed to target suicidal ideation and self-harming behaviors. The Behavioral Medical Center at Loma Linda University houses a Stage 1 DBT-A intensive outpatient program (IOP) for adolescents. While showing significant improvement, adolescent graduates continued to experience distressing emotional and behavioral difficulties and expressed a need for additional services. A Stage 2 Outpatient Adolescent Recovery (SOAR) program was delivered to Stage 1 graduates to address reported emotional and behavioral difficulty and the maintenance of DBT skills. Despite youth interest in SOAR, we had over a 50% dropout rate. The aim of this study is to examine factors involved in treatment dropout. This mixed methods study uses grounded theory to analyze data from qualitative interviews and self-report measures. Participants included 46 adolescents enrolled in SOAR during the pilot stage and a small randomized control pilot study comparing SOAR to cognitive behavioral therapy (CBT). We found that the overall dropout rate was 54.3% with no significant differences between SOAR and CBT or between time since graduation from Stage 1 treatment. To examine if demographic and functional factors predict dropout in SOAR we conducted chi-squared tests and analysis of variance tests and found that demographic factors, treatment group, and being in the clinical range of distress were not significantly associated with dropout. Increased emotional disturbance at the start of SOAR predicted higher rates of program completion ($p < .05$). While increased social problems (e.g., substance abuse and sexual behaviors) and behavior dysfunction (e.g., difficulty managing behaviors and impulsivity) at the end of Stage 1 predicted dropout ($p < .05$). Additionally, adolescents and their parents reported through clinical interviews that SOAR aided in increasing emotional stability, distress tolerance, and interpersonal relations. These results indicate that addressing social problems and behavior dysfunction at the beginning of SOAR could help improve dropout rate.

School of Public Health

Saeed Alshahrani
Toni Jehi
Marissa Lee
Ivette Perez-Paquien

SAEED ALSHAHRANI

SCHOOL OF PUBLIC HEALTH PARTICIPANT 2016

My interests into research have been growing since I finished my undergraduate studies at King Saud University in Saudi Arabia. I moved to the United States in 2008 to pursue my graduate studies, attending Florida International University (FIU), Miami, FL, where I obtained my MPH in Biostatistics in 2011. During my time at FIU, I was granted a graduate assistantship position and involved in research activities including applications in biostatistics related to public health. In addition, I participated in a large community intervention program, Beyond Sabor, designed to reduce the obesity burden among Hispanics in south Texas.

In 2012, I was appointed as a lecturer in the Department of Epidemiology and Biostatistics at King Saud Bin Abdulaziz University for health sciences (KSAU-HS) in Saudi Arabia. In September 2013, I started my DrPH program in Epidemiology at Loma Linda University where I have received advanced training in epidemiologic methods and applications. About a year ago, I started working on a project about the use of omega 3 supplementation and its beneficial effects on reducing neuropathy symptoms among Hispanics with type 2 diabetes mellitus under the mentorship of Drs. Zaida Cordero-MacIntyre and Larry Beeson. Such an experience and guidance by my mentors have improved and honed my research skills.

Recently, I have joined the academic and research team at King Khaled University in Saudi Arabia. My contribution involves teaching statistics courses and helping to improve the research practice in southern Saudi Arabia. My career goal is to contribute in the development of research activities in my home country where I aim to establish a research center that attracts health professionals and public health students to engage in research practice and improve community health efforts.

THE EFFECTS OF OMEGA-3 SUPPLEMENTATION ON REDUCIG NEUROPATHY SYMPTOMS IN HISPANIC PATIENTS WITH TYPE 2 DIABETES MELLITUS

Saeed Mastour Alshahrani, W. Lawrence Beeson, Anthony Firek,
Zaida Cordero-MacIntyre, Marino De Leon

School of Public Health, Center for Health Disparities and Molecular Medicine, School of Medicine, Loma Linda University; JL Pettis Memorial VA Medical Center, Loma Linda, CA

The purpose of this study is to evaluate the effects of Omega 3 supplementation on reducing neuropathy symptoms in Hispanic patients with Type 2 diabetes mellitus (DM2). Forty Hispanics aged 25 to 75 with DM2 were enrolled in *En Balance Plus* program, a prospective three-month, case-only design funded by NIH and approved by the Loma Linda University Institutional Review Board (IRB). The neuropathy symptoms were assessed using the short-form McGill pain questionnaire. A 12-hour fast was required for the blood glucose concentration and lipid profiles. Subjects were requested to consume a daily intake of 2000 milligrams of omega 3 fish oil supplements for the whole 3-month study. The change in the proportions of participants who reported symptoms was assessed. We also evaluated the changes in symptoms at different body locations at three months compared to baseline. Eighty percent of the study subjects reported discomfort, dysesthesia or neuropathic symptoms in at least one body location at baseline. After 3 months of participation in the program with the addition of the fish oil supplements, there was a significant reduction in the symptom burden in the subjects (80% vs. 50%, p=0.0042). Furthermore, there was a significant reduction in the number of body locations reported by all participants exhibiting neuropathy symptoms (119 vs. 53) with mean difference of 1.65 locations (p=0.0012). Our study provides evidence on the beneficial effect of the use of omega 3 supplementation as a part of a balanced diet to reduce and manage the neuropathic pain symptoms among Hispanics with Type 2 diabetes mellitus.

TONI JEHI

SCHOOL OF PUBLIC HEALTH PARTICIPANT 2016

Loma Linda University has been my home for the past two years; I am enrolled in the PhD program in nutrition with an emphasis on biostatistics. I was able to utilize every minute of my time in this school to augment my academic background in the field of public health and enhance my research skills. I accomplished the latter by participating in studies conducted by the faculty and by engaging in the process of data analysis and writing. I recently finished writing a paper for a nutrition post-doctoral student. The study investigated the association between nut intake and weight gain. Lately, I joined a new research team involved in several studies examining the impact of the *En Balance* program (a 3-month demonstration program funded by the NIH) on several health outcomes in a Hispanic population. Aside from my research work at LLU, I am currently doing my practicum for the RD program at WIC. This recent experience has introduced me to the clinical aspect of nutrition and has helped me to comprehend the pressing needs of the Riverside population.

I aspire to graduate by the end of the year 2018 and become an assistant professor in the nutrition field. Through the support of my mentors Dr. Rajaram and Dr. Zaida Cordero-MacIntyre and through the guidance of every LLU member, I hope to succeed in accomplishing these goals and to start my teaching journey.

THE EFFECTS OF OMEGA-3 SUPPLEMENTATION ON THE LIPID PROFILE AND ADIPOSE INDICES IN HISPANICS WITH TYPE 2 DIABETES MELLITUS

Christy Mota, Toni Jehi, W. Lawrence Beeson, Anthony Firek,
Zaida Cordero-MacIntyre, Marino De Leon

Center for Nutrition, Healthy Lifestyle and Disease Prevention, School of Public Health,
Center for Health Disparities and Molecular Medicine, School of Medicine,
Loma Linda University, Loma Linda, CA

Diabetes Mellitus (DM) engenders thousands of deaths on a yearly basis, highly augmenting the risk for cardiovascular disease. DM is associated with drastic irreversible complications and an abnormal lipid profile. Evidence suggests an imperative role of n-3 PUFAs (from marine sources) on improving the lipid profile and adipose indices in patients with type 2 DM. However, despite promising results of studies investigating the effect of omega-3 fatty acids, the association has not been probed much in underprivileged populations. Thus, the primary objective of this study was to investigate the effect of the diabetes education program, *En Balance Plus,* on lipid profiles and adipose indices among Hispanic adults with DM2, using supplemental fish oil. The *En Balance* study subjects consumed a daily intake of 1000 milligrams of omega 3 fish oil (twice daily) for 3 months. During baseline and after the intervention, a comprehensive evaluation of physical, blood, dietary and body composition assessments was conducted to evaluate the health status, dietary habits and total and regional body compositions of the subjects. The Omega-3 supplementation for Hispanic patients in the *En Balance* program contributed to a significant attenuation in LDL cholesterol, an improvement in glycemic control, and a decrease in trunk and total fat. Such promising results could be associated with the Omega 3 supplementation along with the lifestyle modifications of the diabetes education program. Further investigations should assess the long term effect of the Omega 3 supplementation on the lipid profile and isolate its role from the rest of the lifestyle modifications.

MARISSA LEE

SCHOOL OF PUBLIC HEALTH PARTICIPANT 2016

Currently, I am pursuing a Masters of Public Health at Loma Linda University's MPH Nutrition and Dietetics (RD) program. In 2013, I graduated from the University of California, Berkeley, with a BS from the Haas School of Business, BA in Media Studies, and a minor in early childhood education. Heralding from the Silicon Valley, I love innovating and creating synergy among different fields to solve social problems in communities both locally and globally. My past experiences include healthcare sales, marketing, strategy consulting, and social entrepreneurship by co-founding a mission-focused business. But my favorite experiences have been working directly in the community whether it was leading a public health mission trip to Mexico, volunteering in low-income preschools, helping low-income communities file their taxes, or backpacking through the majestic Himalayas in Nepal sharing physical and spiritual health. Ultimately, I hope to use my education and experiences to play a part in seeing whole individuals thriving, especially in developing countries.

This past year, I've had the privilege of working with Dr. Juan-Carlos Belliard, Nipher Malika, and a team of four talented graduate students on a project with the youth and community members in the Desert Highland Gateway Community. From the detailed creation of a survey to nuances in community engagement, I have learned so much in this project and am extremely thankful to Dr. Belliard and Ms. Malika for their guidance and support and to my teammates for their dedicated passion and partnership.

BREAKING THE CYCLE: MOBILIZING MARGINALIZED YOUTH IN PALM SPRINGS

Marissa Lee, Givan Hinds, Maria Anaya, Bethsaida Charlot,
Jonathan Portney, Nipher Malika, Juan Carlos Belliard

The Institute of Community Partnerships, Loma Linda University, Loma Linda, CA

The United States has the highest rate of incarceration in the world at 336 per 100,000. Among African Americans, this rate increases to 521 per 100,000. Parental incarceration has been found to be associated with delinquency and criminality among their children. In the Desert Highland Gateway Community in Palm Springs, CA, 40 percent of the adults have been or are incarcerated. Community leaders and partners seek to address this high rate of incarceration which impacts the quality of life of its residents. Therefore, we sought to identify the risks associated with crime and delinquency among the Desert Highland Gateway youth. A mixed methods research design was used to assess the youth through focus groups and a survey tool. Results revealed that antagonism with police, issues with authority, gang prevalence, and anticipation of future incarceration were present in youth experiences. Additionally, youth reported high levels of conflict, adverse childhood experiences, detention, stress and exposure to drugs and alcohol. Despite these risk factors, the youth also reported high levels of hope and family support in life and in school. To break the cycle of incarceration, we must find ways to harness these assets in the youth to lower delinquency and criminality and empower them to achieve a higher quality of life.

IVETTE PEREZ-PAQUIEN

SCHOOL OF PUBLIC HEALTH PARTICIPANT 2016

I am a Chilean graduate student working on my Master's degree in public health. My Bachelor's is in education, and I am passionate about community service to populations with disparities.

For over 10 years I was a professor at several universities for the government in Chile in education and public health as well as developing community projects. My work has shown me the true meaning of disparities, the reality and gaps for the poor and vulnerable. My projects have been for youth centers, orphanages, women's prisons, and coordinated community programs for the benefit of poor and rural populations.

Currently, I work with the Center for Health Disparities and Molecular Medicine as a researcher of Hispanic populations in San Bernardino County, CA. Here I have expanded my horizons in community research and been mentored by Dr. Zaida Cordero-MacIntyre and Dr. Marino De Leon. In addition, I have joined the team of professional volunteers from the Ministry of Home and Family SDA Southeastern California Conference, participating in programs, developing seminars and projects to train Hispanic churches, and promoting health, lifestyle and family counseling. My future projects are to continue my doctoral studies in public health and extend my volunteer work in churches, jails and California Hispanic communities by conducting projects with SDAs.

In the family area, I wish to see my two teenagers, Mark and Shalom, fulfill their dreams of becoming professionals in God's service to humanity in this great country that has welcomed us generously.

IMPROVING COMPLIANCE AND OUTCOMES IN HISPANIC DIABETIC SUBJECTS USING CULTURALLY SENSITIVE TELEPHONE INTERACTIONS TO REINFORCE LIFESTYLE INTERVENTION

Ivette Pérez-Paquien, Christy Mota, W. Lawrence Beeson, Anthony Firek, Zaida Cordero-MacIntyre, Marino De León

Center for Health Disparities and Molecular Medicine, School of Medicine; Center for Nutrition, Healthy Lifestyle and Disease Prevention, School of Public Health, Loma Linda University, Loma Linda, CA

Hispanics with diabetes mellitus (DM) have a low rate of compliance and interaction with conventional medical services. Unfortunately, they suffer from an increased risk for DM, a chronic disease requiring early and consistent interaction and follow-up care. Overcoming this deficiency in the provision of healthcare is an important factor in improving health outcomes in Hispanic patients with DM. To address this deficiency, this study uses follow-up phone calls and an educational program developed in Spanish. The 40 subjects were recruited through group meetings from four different Hispanic Adventist churches in San Bernardino County, CA. The study provides information on nutrition education and exercise focused on the control of DM with the addition of fish oil (FO) supplements orally to improve intake of omega-3 fatty acids. Subjects were contacted by telephone weekly in Spanish for information regarding diet, exercise, symptoms of diabetic neuropathy, and compliance with FO supplement. The information, collected during the last 3 months of the study, was then placed into four categories—exercise, diet, neuropathy, and compliance—counting the number of individuals demonstrating change in any of the categories. A change percent was used to analyze any observed differences and compared to baseline. As a result, an increase in the importance of exercise (+ 60%), improved dietary changes (+ 37.5%), and low symptoms of neuropathy (-0%) were observed. The subjects claimed 100% full compliance with taking FO supplements. The weekly phone calls in Spanish to our Hispanic subjects with DM reinforce the principles of the educational program. Improvement in lifestyle changes and medication compliance were particularly impressive. As this group has a low compliance and assistance with medical interventions, our program can be an important intervention promoting improved compliance and results in Hispanic patients with DM.

Summer Undergraduate Research Program (SURF)

Candice Baber
Noah Chun
Briana Hickey
Lam Lay
Gabriel Martinez
Ashleigh Moten
Caitlin Smith
Theo Teichman
Alice White

CANDICE BABER

SURF PARTICIPANT 2016

I attend California Baptist University in Riverside, CA, and am a senior studying biology with a concentration in secondary education. My ultimate career goal is to be a biology professor, which I hope to do after obtaining my PhD in biology. During my undergraduate career I have been elected into the Alpha Chi Honor Society, awarded a Who's Who Award, and been on the Provost's list every semester. I also created the Biology Education Club on my university campus and currently hold the title of Vice-President.

This summer I am working under the leadership of Dr. Christopher Wilson and the management of Rhaya Johnson. The research done in my lab includes the use of vagal nerve stimulation to reduce the inflammation that causes disturbed breathing patterns in preterm infants. The main areas of study are the nucleus tractus solitarii (nTS) and the hypoglossal motonucleus (XII) of the autonomic brainstem, which control respiration.

During my time here at Loma Linda, I have learned a lot about what research is and what it is not. I have also learned about what science is and what it is not. As I go through not only this program but also life, I remember 1 Corinthians 9:25-26, which states: "They do it to win a prize that will fade away, but we do it for an eternal prize. So I run with purpose in every step" (NLT). I am so grateful that these amazing scientists have taken the time to train me and guide me. This summer is definitely a productive one, and I could not be more appreciative.

THE EFFECT OF VAGAL NERVE STIMULATION ON TNF✔ EXPRESSION AFTER ACUTE INFLAMMATORY CHALLENGE

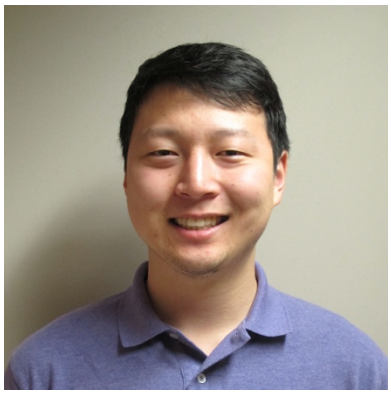
Candice Baber, Rhaya Johnson, Christopher Wilson

Center for Perinatal Biology, School of Medicine, Loma Linda University, Loma Linda, CA

A major challenge for preterm infants is lung infection, which, if left untreated, can lead to systemic infection and long-term complications. Without treatment, neonatal sepsis can be fatal, so finding effective treatment options is an important problem. One of the major causes of respiratory infections in neonates is chorioamnionitis or inflammation of the amniotic membranes and chorion. Pre-term babies can also be exposed to potentially harmful bacteria during birth and immediately after birth. The current treatment for preterm injury of the lungs is broad-spectrum antibiotic therapy, which is not ideal for infants because it can lead to complications. Since approximately 40% of preterm births are complicated by lung injury, it is urgent that a more effective way to deal with this problem arises. Our hypothesis is vagal nerve stimulation, an FDA- approved treatment for epilepsy and depression, can be used to decrease the inflammation caused by systemic infection. We are assessing the effectiveness of VNS to treat sepsis by monitoring the pro-inflammatory cytokine tumor necrosis factor-alpha (TNF✔) in neonatal rats injected with lipopolysaccharide (LPS). We quantify the levels of TNF✔ in respiratory/airway control regions of the brainstem, including the nucleus tractus solitarii (NTS) and the hypoglossal motonucleus (XII). Our results thus far show no significant differences between animals given LPS and those given LPS with vagal nerve stimulation though our results are likely due to the small number of animals in each test group. This project will be continued using a larger number of test subjects so more data can be collected.

NOAH CHUN

SURF PARTICIPANT 2016



While I was born and raised in San Marcos, CA, I now hail from Beaverton, OR. I am currently a senior at Andrews University in Berrien Springs, MI, and will be the first ACS approved biochemistry major from there with minors in both mathematics and biology. Before coming here, I researched naked noble metal nanoparticle synthesis under Dr. Getahun Merga. My passion for chemistry and biochemistry influenced me to serve as the Chemistry Club President at my school as well. In my free time, I surf the internet or walk around when it's not too hot, but my favorite thing to do is to cook and eat good food.

In Dr. David Baylink's lab, I researched under Dr. Xiao-Bing Zhang on regenerative medicine. Our focus was on cellular reprograming and gene therapy of blood cells to mesenchymal stem cells with hopes of developing a cure for bone problems. Researching under Dr. Zhang was very enjoyable due to the friendly yet serious environment. Honestly, everything about what we were doing was my favorite thing to do because one of my career goals has been to do research on stem cells. This opportunity solidified my desire to continue pursuing this field.

IMPROVING DONOR PLASMID DESIGN FOR CRISPR KNOCK-IN AND INCREASING VIRAL TITER IN 293T CELLS WITH CAFFEINE

Noah Chun, Cameron Arakaki, Xiaolan Li, Wanqiu Chen, David Baylink, Xiao-Bing Zhang

Division of Regenerative Medicine, School of Medicine,
Loma Linda University, Loma Linda, CA

Cellular reprogramming and genetic engineering, while controversial, have undoubtedly advanced regenerative medicine. Two important tools used to perform the genetic editing are CRISPR and lentiviruses. We focused on 1) improving CRISPR knock-in efficiency by changing homology arm length in the donor plasmid and 2) improving lentiviral production with caffeine. CRISPR currently stands at the technological forefront of these fields. Unlike lentiviruses, CRISPR has a greater therapeutic application due to its ability to selectively remove and insert genes of interest. However, CRISPR is not as efficient as lentiviruses in inserting genes. Thus, we designed a series of donor plasmids with varying lengths of homology arms with a fluorescent gene marker and transfected them into 293T cells. We then analyzed the knock-in efficiency by flow cytometry. Despite the non-specificity of lentiviruses, they are useful tools in observing overexpression of genes. However, lentiviral production can take up to a week to complete. Thus, we sought efficient and economical modifications that might increase the amount of virus produced. We anticipated that caffeine could be a promising simple chemical approach to increase viral production as opposed to the established sodium butyrate method. Caffeine (2mM) was added to 293T cells 17 hours following transfection. Two days later, the media containing the viruses was added to fresh HT180 cells to determine the viral concentration by quantifying GFP positive cells by flow cytometry. We found that 1) donor plasmid homology arms in the range of 300-600bp in length appear to have the greatest knock-in efficiency; 2) caffeine was not as effective as sodium butyrate at inducing viral production.

BRIANA HICKEY

SURF PARTICIPANT 2016

I started my journey of higher education at Chaffey Community College, located in Rancho Cucamonga, CA, with plans to become an accountant. After I had finished a few business classes, I realized I desired a more fast-paced and challenging career path. At this point I transferred to California State University, San Bernardino, CSUSB, as a biochemistry major. Once I started at CSUSB, I was given an opportunity to participate in undergraduate research and have continued to do so for about a year and a half now. By working with the chemistry department faculty regularly, I was made aware of a grant opportunity provided by the NIH for undergraduates known as the Maximizing Access to Research Careers (MARC) program. I applied and was accepted and have been a MARC fellow for the past year and will be for this coming year as well. I am now a senior at my university and plan to apply to graduate school this coming fall in order to pursue a career in research.

It was through the MARC program that I learned about the SURF program at Loma Linda University. This summer I have been working closely with Dr. Erik Behringer and Charles Hewitt. Their project researches Ca^{2+} ions and their associated proteins to determine the effects they have on aging of mitochondria in the brain cells of mice. The information learned from this research will then be related to diseases such as Alzheimer's in humans. Through my work on this project I am now able to see the direct effects that work done in a lab can have on bettering human life. I am very grateful to Dr. Behringer and his lab for all the opportunities and experience that I have gained.

MITOCHONDRIAL REGULATION OF CALCIUM AND ELECTRICAL SIGNALING IN THE CARDIOVASCULAR AND NERVOUS SYSTEMS WITH ADVANCING AGE

Briana Hickey, Brianna Calderon, Dylan Bowman, Charles Hewitt, Erik Behringer

Department of Basic Sciences, Division of Pharmacology,
School of Medicine, Loma Linda University, Loma Linda, CA

Old age (i.e., >60 years) is the key risk factor for the development of cardiovascular disease and cognitive decline. Despite the well-known cooperation between components of cerebral perfusion and neuronal activity, such functions are not commonly integrated for investigation. Furthermore, we now recognize the vulnerability of the regulation of calcium homeostasis and alterations in cellular membrane potential (V_m) with advancing age whereby mitochondria play a central role. Thus, we are testing the hypothesis that the mitochondrial calcium uniporter (MCU) may regulate the interface between calcium homeostasis and regulation of cellular membrane potential (V_m) throughout cardiovascular and neuronal systems with advancing age. Regions of intact cortex, hippocampus, superior cervical ganglia, heart, cerebral arteries, and endothelial "tubes" are freshly isolated from C57BL/6 mice (age: 4 to 26 months, male and female). Molecular analyses include protein measurements of the MCU via Western blot and immunofluorescence. Physiological assessments (+/- pharmacological stimulation and block of MCU) include simultaneous photometric measurements of calcium/reactive oxygen species and sharp electrode determinations of intracellular membrane potential and cell-to-cell coupling through gap junctions in freshly isolated and intact tissues. Also, we will examine mouse models of Alzheimer's disease (e.g., 3xTg-AD, 5XFAD; fully develop pathology by middle age) and mitochondrial-targeted catalase mice (mCAT; readily decompose cellular hydrogen peroxide and live ≈5 months longer vs. normal C57BL/6) as negative and positive controls for healthy aging, respectively. Resolving interactions between cardiovascular and neuronal function in the context of mitochondrial calcium signaling will enable our efforts to ameliorate neurodegeneration and a diminished quality of life with aging.

LAM LAY

SURF PARTICIPANT 2016

"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science." This quote of Albert Einstein is one of the best quotes I have ever heard. I love mysterious things. I love the mystery behind black holes. I love how quantum mechanics is different from classical mechanics that is common in our everyday life. I love how the human body has 37.2 trillion cells and each cell contains their own mysterious gene. I love science because it is mysterious. That's why I am pursuing a career in science. Every scientific conundrum is a treat for me, and I am excited to solve each. Unfortunately, life is short, and I cannot pursue all different fields of science. I had to choose one thing to study, and I chose physics that encompasses everything from the largest things like galaxies and black holes to the smallest subatomic particles.

Born in a developing country, Vietnam, I understand the importance of education and hard work. To me, the saying that "there is no such thing as a free lunch" means that success requires effort and hard work. Being a scientist is not easy, and it is even more difficult for those living in a developing country. Therefore, I decided to come to America. I am currently studying physics at Walla Walla University.

This summer I am working on modeling the optical response of gold and silver nanoparticles with Dr. Christopher Perry and building an air sensor with Dr. Ryan Sinclair at Loma Linda University. I have learned a lot from my instructors and my research partners. I am pleased to have had the opportunity to participate in SURF.

DEVELOPMENT OF A LOW-COST AIR QUALITY PARTICULATE SENSOR FOR USE BY CITIZEN SCIENTISTS

Lam Lay, Timothy Boskovic, Christopher Perry, Ryan Sinclair

Department of Basic Sciences, School of Medicine, School of Public Health, Center for Community Resilience, Loma Linda University, Loma Linda, CA

The Pueblo Unido Community Development Cooperation (PUCDC) in Mecca, CA, has requested assistance in monitoring the sometimes poor air quality of the Eastern Coachella Valley of Riverside County, CA. Only one air sensor is recognized by the South Coast Air Quality Management District (SCAQMD) in the Western Palm Springs area of the valley, and it is 25 miles away from the climatically different Eastern Coachella Valley. Therefore, the PUCDC has requested air quality monitoring specific to the Eastern Coachella Valley. New low-cost technology is available to use, but there are no field-ready configurations that the community-based stakeholders can afford and/or configure. To address this need, we use a Raspberry Pi Linux-based miniature computer to stream real-time data from a Dylos 1100 Air Particle Counter to a web-based data server. The Dylos uses a laser-based sensor to measure two types of particles in the air: PM 2.5 (tiny air pollutants that are less than or equal to 2.5 μm in diameter) and PM 10 (larger particles that range from 2.5 to 10 μm in diameter). The sensor yields particle counts that the Raspberry Pi logs and converts to a concentration in terms of $\mu g/m^3$. This concentration represents the amount of the size particle (PM10 or PM2.5) per unit volume (one meter cubed) of air. These concentration estimates are used to calculate an Air Quality Index (AQI) that is a unit-less number, ranging from 0 (for clean) to 500 (for maximally polluted). The AQI makes our data stream understandable to the public and comparable to the official air quality data reported by the SCAQMD. Our group has constructed an outdoor enclosure using plastic bowls. We plan to deploy the sensor in an outdoor location within Loma Linda City for a few days before the sensor is placed permanently in the Eastern Coachella Valley. Over the past 2 weeks, the sensor output on the Internet showed a consistent data stream with stable and reasonable readings. We anticipate this project will inform the public about the air quality in the Coachella Valley and help citizen scientists build similar sensor systems.

GABRIEL MARTINEZ

SURF PARTICIPANT 2016

"There is hope in dreams, imagination, and in the courage of those who wish to make those dreams a reality." *Jonas Salk*

My parents grew up as farmers in Mexico. In their mid-twenties, they decided to pursue the American dream. They worked arduously to provide my brother and me with greater opportunities than they had. My brother graduated from Southwestern Adventist University with a Bachelor of Science in Computer Science and now works in information technology. I am currently an undergraduate student at the University of Houston (UH), majoring in mathematical biology and have an AA degree in General Studies AA and an AS in Life Science from San Jacinto College in Houston, TX.

I have previously volunteered at Texas Children's Hospital (emergency room), and Ben Taub Hospital (post-operative care). Additionally, before participating in the SURF program, I volunteered in a medical brigade trip to Guatemala led in part by the nationally recognized premedical honor society at UH, Alpha Epsilon Delta (AED). AED worked alongside Humanity First to provide a free clinic and medical supplies to two different locations for one week, serving several hundred patients a day.

My professional goal is to help patients. Some patients need help to stay alive, some to live a more fulfilling life, and some to go on peacefully. I want to make a difference in patient's lives. I admire the impact Jonas Salk was able to have on the world. It would be phenomenal if I could do something similar in some aspect.

My personal goal is to have a career which is mentally stimulating, will keep me financially stable enough to tend to my aging parents for the rest of their lives, and allows me to provide an academic education for them like they have given me.

MATHEMATICAL MODEL FOR TUMOR CONTROL AND TOXICITY IN DIFFUSE BRAINSTEM GLIOMA TREATED WITH CARBON ION THERAPY

Gabriel Martinez, Angela Morales, Ying Nie, Reinhard Schulte

Division of Radiation Research, Department of Basic Sciences, Department of Neurosurgery, School of Medicine, Loma Linda University, Loma Linda CA

Diffuse intrinsic pontine glioma (DIPG) is an aggressive tumor infiltrating the brainstem. DIPG is diagnosed in children between the ages of 5 and 9. Less than 1% of children with DIPG survive beyond 5 years. The objective of this study is to develop a mathematical model to predict the outcome of carbon ion therapy for DIPG. A literature review was performed to determine the current standard treatment and to find model input parameters. The current standard treatment is radiation therapy with two opposing, photon beams to total dose of 54 - 60 Gy in daily fractions of 2 Gy. Carbon ion therapy is potentially more effective and usually given in fractions of 4 Gy in a dose-equivalent (for brain stem toxicity) regimen of 36 Gy in 9 fractions. The linear-quadratic (LQ) model of radiation effects was used to determine cell survival after radiation. Evidence suggests that DIPG has a small population of cancer stem cells responsible for tumor recurrence. A carbon treatment plan was optimized with the local effect model (LEM1) at the Heidelberg Ion Therapy (HIT) center in Germany and made equivalent to the 36 Gy in 4 Gy fractions plan with photons in terms of brain stem toxicity. The effect of carbon ions on the LQ model parameters was estimated based on ionization clustering in small nanometer sites. Using this modified LQ model and a Poisson distribution-based TCP model, we are now able to calculate TCP for carbon therapy as a function of the density of tumor stem cells. For our calculations we will use stem cell density as a variable ranging from $1\text{-}10^4$ cells/mm^3. The model developed in this study will allow us to estimate the chances of local tumor control as a function of stem cell density. Further selective radiosensitization of tumor stem cells to carbon radiation will be necessary if the TCP at expected stem cell density will not exceed 10%. Using this modeling exercise, we hope to inform the pediatric oncology community of the usefulness of carbon ion therapy for DIPG, eventually to be tested in a clinical trial.

ASHLEIGH MOTEN

SURF PARTICIPANT 2016

"You have at least three challenges ahead of you," my mom smiled. "You're a woman and you're black . . . and we're broke." My mom smiled because she knew I would overcome every obstacle in my way as I began my journey to become a surgeon. It has definitely been tough, but my passion for people and science exceeds all else. I am now majoring in biomedical sciences and minoring in Spanish at Oakwood University. There, I participate in two research labs. I mentor underclassmen through tutoring and lab instructing, and I also enjoy volunteering for many causes and organizations.

This summer has been an excellent experience for me. I have learned so much as I participated in the research of Dr. Andre Obenaus's lab. My exemplary mentors have taught me much. We are studying the effects of myelin formation in adolescent brains after single and repeated traumatic brain injuries. I have become knowledgeable about the patience and persistence that it takes, not only in the lab, but in the many facets of science and healthcare. Taking part in research has made me even more excited as I journey in my pursuit to become an active member in medicine. I am further aware of my longing to become a surgeon.

I have always been told that I have a "bleeding heart" because of my tremendous passion for helping others, from small everyday tasks to being a good friend or listener to community projects to worldwide mission trips. I am loving the quest I am currently on because I know that someday I will be able to reach countless people while doing a job I enjoy. To learn, to grow, to change the world—those are my continual aspirations.

REPEATED PEDIATRIC MILD TRAUMATIC BRAIN INJURY LEADS TO LONG-TERM BEHAVIORAL ALTERATIONS AND INCREASED OLIGODENDROCYTES IN THE ANTERIOR COMMISSURE

Ashleigh Moten, Yaritxa Gamoba, Jeong Bin Lee, Jonathan Chan, Mary Hamer, Andrea Pardo, Andre Obenaus, Bethann Affeldt

Department of Pediatrics, School of Medicine, Loma Linda University, Loma Linda, CA

Mild traumatic brain injury (mTBI) is a public health concern due to associated decrements in behavioral and neuropsychological outcomes. Studies have shown repeated injuries to the adult brain can exacerbate these deficits, but effects of mTBI in the developing brain have not been extensively investigated. We studied the long-term effects of pediatric mTBI on the white matter of the anterior commissure (AC). We used immunofluorescence (IF) to quantify oligodendrocyte precursor cells (OPCs) and oligodendrocytes (OLs) and assessed changes to these myelin-forming cells in the AC. We hypothesized repeated mTBI (rmTBI) in the developing mouse brain would lead to a decrease in the number of OPCs and OLs, resulting in white matter deficits and associated behavioral alterations. mTBI was induced at postnatal day 14 using a novel closed-head injury (CHI) model that includes a rotational component. After CHI, the mice were evaluated at 60 days post injury using open field (activity levels) and light-dark (anxiety) behavioral analysis, followed by diffusion tensor imaging (DTI) and IF in three experimental groups (sham, single mTBI, and rmTBI). Unexpectedly, we observed rmTBI resulted in a significant increase in the number of OPCs and OLs in the AC. DTI analysis revealed higher fractional anisotropy (FA), meaning diffusion in the white matter is hindered due to microstructural changes, and lower radial diffusivity (RD), representing a decrease in axonal diameters and density. Behavioral testing showed increased activity and anxiety, indicating the animals were more hyperactive after rmTBI. The marked increase in OPCs and OLs indicates myelin is developmentally immature and may also represent a secondary response to compensate for white matter damage sustained in the first injury. The changes seen in FA and RD reflect lack of myelination of the OPCs and OLs. rmTBI to the developing brain leads to long-term oligodendrocyte changes, including abnormal OL development and disruption of myelin formation, with behavioral alterations.

CAITLIN SMITH

SURF PARTICIPANT 2016

I am a senior at the University of Redlands working towards a Bachelors of Science degree in Chemistry with a minor in Biology. During the school year I work in the community as a tutor for local disadvantaged youth. I also volunteer my time at a local hospital working with children that suffer from physical and mental disabilities. These experiences have allowed me to realize I want to invest my efforts in the betterment of others. In order to accomplish my goals, I hope to attend an MD/PhD program that will give me the tools to help make a difference in the world.

In the future I dream of using my education to bring healthcare to those in desperate need of it all across the world. I also hope to be able to work on research studying a cure for Alzheimer's disease because it has greatly affected the lives of people close to me. I am very fortunate that this summer I was given the opportunity to get a jumpstart on that dream by getting a chance to work in Dr. Richard Sun's lab studying early detection and effective treatments of neurodegeneration which can provide significant clinical impacts for diseases like Alzheimer's and Multiple Sclerosis.

This summer program has shown me that nothing comes easy in research, but the reward of working towards and discovering information that can lead to a better tomorrow is well worth the hard work. I would like to thank my mentor Dr. Richard Sun and Chris Nishioka for taking me into their lab and allowing me to partake in this amazing opportunity.

CORRELATING THE SEVERITY OF WHITE MATTER DAMAGE REVEALED BY DIFFUSION TENSOR IMAGING (DTI) WITH THE APPEARANCE OF HYPER PHOSPHORYLATED TAU WITHIN THE VISUAL PATHWAY OF AN ALZHEIMER'S DISEASE MOUSE MODEL

Caitlin Smith, Chris Nishioka, Shu-Wei (Richard) Sun

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

Aggregates of hyperphosphorylated tau in neurons are a primary hallmark of Alzheimer's disease (AD). Pathogenic tau is thought to play a role in axonal and neurodegeneration, which causes neuronal loss and brain atrophy in AD. White matter abnormalities, among others, occur early before the onset of dementia. Tau pathology is associated with disease severity, but its specific role in precipitating white matter damage has not been examined thoroughly. Here we quantified the degree of white matter damage using DTI, a non-invasive imaging technique, and investigated the underlying neurodegeneration associated with pathological tau aggregates using immunohistochemistry. We focused on areas in the visual system because it is comprised of a very homogenous population of axons compared to other white matter tracts. Using mice that express the mutant P301L variant of human tau prone to hyperphosphorylation, the preliminary data suggest there may be a link between the severity of white matter damage and aggregated tau. In the future, the degree of white matter degeneration in AD may give us important clues about tau pathology in the brain's white matter tracts. This will help us understand the tau pathologies involved in white matter abnormality that lead to neuronal death in AD.

THEODORE TEICHMAN

SURF PARTICIPANT 2016

I am currently studying neurobiology and music composition at Carnegie Mellon University in Pittsburgh, PA. For the future, I plan to forge a path that integrates my interests and ideas from both the sciences and the arts. In the realm of neuroscience I am particularly interested in focusing on neuropsychopharmacology, especially with regard to how different neuropsychological disorders can interact with and alter an individual's sense of self. Outside of my work in the lab, my work in music and the arts takes a strongly interdisciplinary format as I draw much of my material from science topics. I use this artistic side to inform the human-ness of research and to better understand the people I hope to help, as well as allowing me to make science and medicine more approachable for people through creative communication and reinterpretation.

This summer I am working in the lab of Dr. Marcelo Vazquez in the Department of Radiation Medicine looking at cytogenetic biomarkers of differences in radiation sensitivity between individuals. My favorite part of research is seeing how a simple change can cause many, varied downstream effects and seeing how that all falls into place. Through my participation in the SURF program, I have been able to expand this viewpoint by connecting the basic molecular and cell research methods we are employing to the far downstream effects we believe they may have on the lives of actual people.

Lastly, I would like to thank Dr. Vazquez for all of his help and guidance in the lab as well as my medical student lab mates for all of their assistance at the bench and for all of the time we spend pondering the great mysteries of science.

CYTOGENETIC BIOMARKERS FOR INDIVIDUAL VARIATION IN RADIOSENSITIVITY

Theodore Teichman, Brian Chou, Antonella Bertucci, Marcelo Vazquez

James M. Slater MD Proton Treatment and Research Center,
Department of Radiation Medicine, Loma Linda University Medical Center,
Loma Linda, CA

With the increasing specificity of radiotherapy delivery mechanisms, there has also been a push to find methods to proactively ascertain individual differences in radiosensitivity to be integrated into treatment design in order to minimize secondary morbidities and maximize treatment efficacy. We sought to analyze the efficacy of micronuclei assay-based dose response curves from individual patient blood samples in predicting the effect of radiation on the patient's normal tissues. Towards this aim, we performed an *in vitro* proton irradiation of peripheral blood lymphocytes obtained from patients before their first dose of therapeutic radiation and subsequently performed a micronuclei assay for complex DNA damage levels for 18 out of 40 prostate carcinoma patients sampled thus far. Next, we obtained *in vivo* irradiated blood samples for each patient at the beginning, middle, and end of the proton radiation treatment and performed a micronuclei assay on 16 out of 40 sampled patients. The integral dose to the peripheral blood lymphocytes was then calculated for each patient based on treatment plan and compared with micronuclei data. Finally, patients were sorted into three groups based on clinical factors—non-sensitive, normally sensitive, hyper-sensitive—and their pre-treatment micronuclei dose response curves were sorted and compared between groups. From these analyses, there was found no way to clearly and consistently predict clinical effects based on the individual peripheral blood lymphocyte micronuclei assay-dose response curve before treatment based on the presently processed sample size. This finding brings to question the predictive power of the micronuclei assay as a tool for personalized medicine as has been proposed in previous literature.

ALICE WHITE

SURF PARTICIPANT 2016

I graduated from UCLA in June with a Bachelor of Science in Psychobiology. I have been admitted to the University of Cambridge in England to study for my Master's degree in Basic and Translational Neuroscience this fall. I also attended high school in New Zealand and elementary school in England. Such a multicultural upbringing has provided me with an exciting and dynamic view of the world in which I strive to obtain knowledge from different perspectives.

As a Division I athlete at UCLA on the women's rowing team, I never had the time to pursue research to the extent that I wanted to. The thought of chasing new discoveries into the early hours of the morning and following the processes and outcomes inspired by my own ideas is something that is beginning to become a reality thanks to the SURF program. Mathematical modeling became a focus of mine after I attempted to write a set of differential equations to model the rowing stroke and give my team the champion's edge.

Though I eventually realized that such a project was beyond my expertise, I had been introduced to models of physiological, and specifically neurological, processes and bioinformatics. I applied to graduate school under the premise I could not only create such models to describe normal brain function but also try to elucidate how these systems malfunction in a clinical setting.

This summer I have worked under Dr. David Hessinger. I would like to thank him for creating a platform on which I have been able to learn and experience new ways of thinking as well as my fellow laboratory members for their advice and their humor.

L-TYPE CALCIUM CHANNELS MODULATE NEMATOCYST DISCHARGE

Alice White, Glyne Thorington, David Hessinger

Division of Physiology and Pharmacology, School of Medicine,
Loma Linda University, Loma Linda, CA

The sea anemone, *Aiptasia pallida,* has mechanical and chemical sensory mechanisms to detect and catch prey using eversible, venomous organelles called nematocysts. Extracellular calcium (Ca^{2+}) is required to stimulate mechanoreceptors that trigger nematocyst discharge. Selective organic L-type Ca^{2+} channel blockers and low extracellular Ca^{2+} enhance chemoreceptor-sensitized discharge while L-type channel activators and high extracellular Ca^{2+} inhibit discharge. We localized L-type channels in anemone tentacles using confocal microscopy and a fluorescent L-type channel blocker, dihydropyridine-BODIPY FL. L-type Ca^{2+} channels appear to cluster near nematocyst-bearing cnidocytes in the apical tentacle ectoderm. We confirmed the molecular identity of L-type channels in *Aiptasia* by probing the *Aiptasia* transcriptome with the previously identified anemone (*Nematostella vectensis*) pore-forming alpha subunit (Ca_v1) sequence. From this, we manually constructed a complete *Aiptasia* Ca_v1 sequence. We identified conserved voltage-sensing and DHP-binding motifs diagnostic of Ca_v1 in the *Aiptasia* sequence from multiple alignment analysis with Ca_v1 sequences of other species. To confirm the highly conserved nature of the Ca_v1, we queried the NCBI BLAST database to identify the channel in 16 other species and constructed a phylogenetic tree. This tree confirms a close hierarchical relationship of Ca_v1 sequences across anemones, anthozoans, cnidarians, and into protostomal and deuterostomal lineages of bilaterians. Thus, through a combination of physiological, pharmacological, microscopic, and bioinformatic methods, we show that L-type Ca^{2+} channels mediate the effects of extracellular Ca^{2+} on nematocyst discharge.

Guest Participants

Kate Ball
Grace Esebanmen
Maricela Gallardo
Amber Gonda
Derek Kao
Nathaniel George Mambo
Pierce McCarthy
James McMullen
Stephanie Merlos
Veriah Vidales

KATHRYN BALL

GUEST PARTICIPANT 2016

A native of southern California, I grew up in Bakersfield and began college as a pre-veterinary major. Studying biology and chemistry allowed me the opportunity to be a teaching assistant, which drew me into teaching. Meanwhile, I fell in love with the world of microbes and molecules. I transferred from community college to Biola University where I earned my bachelor's degree in biochemistry and continued to pursue the path of higher education. I earned a master's degree at UC Irvine studying the mechanisms of gene expression in Herpes Simplex Virus-1. After experiencing problems with chronic pain, I developed a deep sense of empathy and my goals grew to incorporate serving those who suffer. I further developed my teaching and research skills as an adjunct faculty member at my alma mater, Biola, for three years and at Azusa Pacific University for one year. I now plan to continue my studies in biomedical sciences at Loma Linda. My long-term goal is to be an educator and research mentor enabling women and men to serve Christ by alleviating suffering in the world.

Currently a first year PhD student rotating in Dr. Nathan Wall's lab, I am working on the effects of curcumin in pancreatic cancer cells. Working in the lab has been a blessing, and I would like to thank Dr. Wall and my lab mates for their support and guidance. In my free time, I enjoy reading and love all things tea and coffee.

CURCUMIN PROMOTES CELL DEATH THROUGH CASPASE-INDEPENDENT APOPTOTIC AND NECROPTOTIC FACTORS IN PANC-1 CELLS

Kathryn Ball, TessaRae Stiff, Carlos Diaz Osterman, Nathan Wall

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

Pancreatic cancer is the third leading cause of cancer-related deaths in the US, and the American Cancer Society predicts it will claim over 41,000 lives in 2016. Chemotherapy resistance is an important issue in many pancreatic cancer patients leading to high mortality rates. PANC-1 pancreatic cancer cells have demonstrated resistance to known chemotherapies and thus serve as a good model for chemotherapy-resistant cancer. Chemotherapy resistance is facilitated by Inhibitors of Apoptosis (IAPs) such as Survivin, XIAP, cIAP-1, and cIAP-2, thus preventing caspase-dependent apoptosis and, consequently, cell death. People groups with the lowest incidence of pancreatic cancer have been found to have diets high in spices such as turmeric and ginger. Curcumin is a turmeric component which has been shown to downregulate IAPs and reduce PANC-1 cell viability. Evidence suggests curcumin may also trigger cell death pathways other than caspase-dependent apoptosis. We hypothesize curcumin overcomes chemoresistance in pancreatic cancer by modulating factors involved with alternate cell death pathways: caspase-independent apoptosis and necroptosis. This study shows curcumin increases levels of Apoptosis Inhibitory Factor (AIF) and Endonuclease G (Endo G) and decreases levels of RIP1 in PANC-1 cells. Furthermore, curcumin induces morphological changes characteristic of cell death as observed by Hoffman microscopy. Curcumin's cell-death modulation makes it a promising template for chemotherapeutic design.

GRACE EDOSEWE ESEBANMEN

GUEST PARTICIPANT 2016

I graduated from Babcock University, Ilishan, Nigeria, with a First Class Bachelor of Science Honors degree in microbiology in 2007. My passion for alleviating human health challenges, led to my pursuit of further scientific training. I am currently a PhD candidate (Biology) in the Department of Earth and Biological Sciences of Loma Linda University, and I am conducting research in the Dr. William Langridge laboratory of the Center for Health Disparities and Molecular Medicine. My dissertation research is based on elucidating the mechanism by which a chimeric fusion vaccine (CTB-INS) induces immune tolerance of dendritic cells. I anticipate future opportunities of translating my scientific skills and training into solutions for global health challenges affecting humanity.

I have been glad to volunteer, on occasion, with the Community-Academic Partners in Service (CAPS), Loma Linda University. I also travel to Nigeria, where I use the platform of the Grace Edosewe Foundation, to engage in community development activities. For leisure, I participate in fun activities exploring nature, playing volleyball, dancing, reading and hanging out with friends. I describe myself as a rustic believer-scientist.

This summer program has given me the opportunity and privilege to mentor Héctor Nieves Figueroa, a medical student from the Ponce Health Sciences University. His courage and determination to learn and succeed has been truly inspiring. His passion and desire to use his medical training to benefit the underprivileged has affirmed my faith that the transfer of knowledge is worthwhile.

THE CHOLERA TOXIN B-PROINSULIN FUSION PROTEIN ACTIVATES SMAD2/3 SIGNALING TO INDUCE INDOLEAMINE 2, 3-DIOXYGENASE BIOSYNTHESIS IN HUMAN DENDRITIC CELLS

Grace Esebanmen, William Langridge

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

Type 1 diabetes, T1D, is a major tissue specific autoimmune disease in which loss of tolerance to pancreatic islet antigens results in T cell mediated destruction of the insulin producing β cells. A fusion protein vaccine composed of the cholera toxin B subunit conjugated to the diabetes autoantigen proinsulin (CTB-INS) was shown to suppress diabetes onset in mice and induce immune tolerance in human monocyte derived DCs (moDCs) via induction of the tryptophan catabolic enzyme, indoleamine 2,-3 dioxygenase (IDO1). Here, we investigate the involvement of the TGF-β superfamily in mediating CTB-INS induction of IDO1 in human moDCs. Real-time polymerase chain reaction (RT-PCR) analysis of CTB-INS treated moDCs showed increased levels of TGF-β1 and activin-A mRNA transcription. Immunoblot analysis of the CTB-INS vaccinated DCs demonstrated increased Smad2/3 phosphorylation levels. The non-toxic bioactive molecule R0158 (Repsox, Sigma), known to bind to the TGFβ type I receptor, blocked Smad2/3 phosphorylation and signaling resulting in the inhibition of IDO1 protein biosynthesis in CTB-INS treated DCs. Neutralization of endogenous TGF-β or activin-A expression did not suppress IDO1 biosynthesis in CTB-INS vaccinated moDCs. Addition of biologically active TGF-β and activin-A cytokines did not induce IDO1 biosynthesis. Together, our data suggest CTB-INS activates TGF-β/activin-A–independent Smad2/3 signaling to induce IDO1 biosynthesis and immunological tolerance in human moDCs.

MARICELA GALLARDO

GUEST PARTICIPANT 2016

I graduated from California State University, San Bernardino, June, 2016, with a Bachelor's of Science in Biology, Pre-Med and minor in psychology. I received a CIRM Bridges scholarship to conduct research in the growing field of stem cells and chose to focus on a subset field in ovarian cancer stem cells in the lab of Dr. Julia Unternaehrer. Prior to this research internship, I worked on developmental toxicological testing on embryonic stem cells, using the fruit fly, *Drosophila melanogaster* as a model. For the past three years, I also volunteered at Citrus Valley Health Partners, a partnership of three hospitals in the Los Angeles County area. I was able to rotate among the different departments in a hospital setting while assisting the staff during patient procedures and helping the patients with comfort and care. I spent most of my time in the operating room, labor and delivery, and obstetrics and gynecology departments. With the experience of both a hospital and research internship, I have been able to narrow my interests to women's health, genetics, developmental biology, and stem cell research. As a Health Scholar and CIRM Bridges Scholar, I am grateful for everything I've learned and that I have been able to integrate both experiences. I am thankful for the privilege of working in Dr. Unternaehrer's lab as I was able to study and characterize stem cells present in ovarian cancer cell lines through immunofluorescence microscopy. I have enjoyed conducting research, getting to know my colleagues, and contributing to the wonderful ongoing research here at Loma Linda. I aspire to integrate research into my future career.

CHARACTERIZATION OF OVARIAN CANCER STEM CELLS BY IMMUNOFLUORESCENCE

Maricela Gallardo, Alyse Huisken-Hill, Hanmin Wang,
Michael McCarthy, Julia Unternaehrer

Department of Basic Sciences, Center for Health Disparities and Molecular Medicine, Loma Linda University, Loma Linda, CA; California State University, San Bernardino, San Bernardino, CA

The objective of this study is to identify cancer stem cells (CSC's) that express pluripotent markers in ovarian cancer through immunofluorescent microscopy. Ovarian cancer is the most fatal gynecological diagnosis for women. It is typically treated with surgery and chemotherapy, which is initially successful; however, most patients experience relapse. Cancer Stem Cells (CSC's) express a similar set of stem cell markers as pluripotent cells and are thought to contribute to chemoresistance and relapse. We study the effect of the epithelial to mesenchymal transition (EMT) on stemness. During EMT, cells acquire mesenchymal characteristics and lose epithelial ones. EMT is caused by Snai1 and other transcription factors that repress epithelial and adhesion molecules such as E-cadherin. There is evidence that the EMT factor Snail represses the miRNA let-7, which we hypothesize results in a higher proportion of CSC in epithelial ovarian cells (EOC) cells. Let-7's major function is to promote differentiation and tumor suppression by targeting oncogenes and pluripotency factors. Elucidation of stem cell markers present in ovarian cell lines will help track the regulation of Snai1 on Let-7 and Let-7's role on stemness. We characterized three (EOC) lines using immunofluorescence microscopy to identify CSC's. Using a panel of biomarkers specific to CSC's, we labeled NANOG, LIN28A, OCT4, SSEA4, ALDH, TRA1-60, CD133, E-CAD, and N-CAD followed by fluorescent secondary antibodies and nuclear labeling with DAPI. OVSAHO was positive for Lin 28a and ALDH; OVCAR-8 for LIN28A, NANOG, CD44, and ALDH; and COV318 for NANOG and ALDH. We found that cells with more mesenchymal morphology (indicative of higher levels of Snail expression) display higher expression of stem cell markers. However, no ovarian cancer cell line characterized perfectly mirrors the pluripotent marker expression seen in NCCIT, our positive control.

AMBER GONDA

GUEST PARTICIPANT 2016

I completed my undergraduate degree at Brigham Young University in Utah. Despite a myriad of history classes required by my BA degree, I developed a fascination with the human body through courses in anatomy, physiology, and genetics. Lectures were interesting, but it was the hands-on labs that pulled me into the world of science. After several clinical experiences, I decided I needed a better understanding of the intricate workings of the human body and was accepted into the master's of anatomy program here at Loma Linda University. With encouragement from faculty and friends, I started to explore the sphere of scientific discovery and research. With the guidance of many mentors, I was welcomed to the NR Wall lab where I am currently pursuing my doctorate degree. My goal after this program is to continue the fight against cancer while teaching anatomy to future clinicians.

My current research focuses on communication of the tumor with its microenvironment. Cancer therapeutics have come a long way in decreasing the size and load of the tumor, but often the surrounding environment prevents complete success. My research has narrowed to the mechanisms by which an oncoprotein, Survivin, isolated in the extracellular compartment, is taken up by and manipulates surrounding cells decreasing the effects for therapeutics.

EXOSOMAL SURVIVIN ASSOCIATES WITH ENDOCYTOSIS RECEPTORS

Amber Gonda, Salma Khan, Heather Ferguson Bennit, Ron Moyron, Nathan Wall

Department of Pathology and Anatomy, Department of Biochemistry,
Center for Health Disparities and Molecular Medicine, Loma Linda University,
Loma Linda, CA

The tumor microenvironment is replete with cells, vesicles, and soluble factors that influence the cancer cell. A novel population of Survivin, an intracellular oncofetal protein, has been identified in the extracellular environment, indicating a possible role in cancer signaling and progression. When introduced to cancer cells, this population of Survivin promotes proliferation, therapeutic resistance, and shows invasive potential. However, the mechanism by which Survivin enters naïve cancer cells is still unclear. Work done by our lab on nano-sized membrane bound vesicles called exosomes suggests a possible route of transfer. We hypothesize that exosomes are the facilitators of Survivin's uptake by naïve cancer cells and function through receptor mediated endocytosis. We have begun evaluation of this hypothesis by investigating the method by which extracellular Survivin exits the extracellular environment. We have isolated exosomes from conditioned media from cancer cells, particularly the HelaS/POZn Survivin cell line. We have determined that both the protein and the mRNA of Survivin is present in exosomes. At this time, we have also shown that Survivin associates with several endocytic receptors. We plan to next evaluate the role that these receptors play in Survivin uptake and whether the association with Survivin is enhanced by exosomal transport. Increased understanding of this mechanism will elucidate a mechanism of oncoprotein transport and identify a target for cancer treatment that may increase effectiveness by targeting both cancer cells and their environment.

DEREK KAO

GUEST PARTICIPANT 2016

This summer marks a significant milestone in my academic life: I am no longer a research virgin. I have been exposed to the cutting-edge field of scientific research. This summer is also a turning point for my extracurricular life. While before, I prioritized my sport, swimming, over everything else, I now find myself more thrilled to immerse myself in science.

I am a junior at Yale University majoring in molecular biophysics and biochemistry, but I grew up on the West Coast, born and raised in Walnut, CA. As a member of the varsity swim team, an all-athlete acapella group, a medical volunteer organization, and a Christian fellowship, most of my free time is spent in the pool and with people who share my passions.

I had the privilege of being mentored by Dr. Abigail Benitez and working alongside Yllen Hernandez. Together, we explored the ever-growing important field of translational research, filling in the gaps to facilitate the transition from bench science to clinical application. Using flow cytometry, we examined the role of B-cells in autoimmune reactions, both in transplant and lupus patients.

What I hope to do in the future is not exactly the work I did at Loma Linda; my career aims are to become a surgeon. However, I intend to use the crucial knowledge obtained during this experience to become a more well-rounded, open-minded, research-aware physician. I learned how to ask questions and find answers. I also discovered that every aspect of healthcare can still be improved. I am grateful to God for bringing me to Loma Linda University and giving me the opportunity to meet all the brilliant minds and friendly faces that walk the hallways of Mortensen Hall.

B CELL SUBSETS AS BIOMARKERS FOR MONITORING B CELL HOMEOSTASIS IN KIDNEY TRANSPLANT PATIENTS

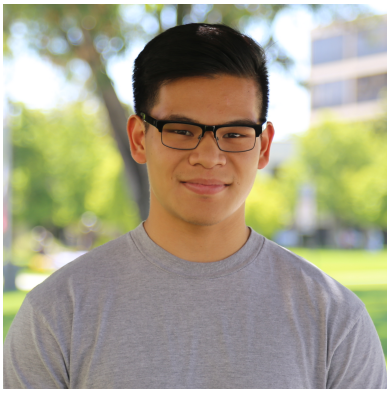
Derek Kao, Yllen Hernandez Blanco, Kimberly Payne, Terry-Ann Milford, Jill Weissman, Michael De Vera, Abigail Benitez

Loma Linda University Transplantation Institute, Loma Linda University, Loma Linda, CA

The number of patients with end stage renal disease is growing; in California, there are 18,620 kidney transplant candidates on waiting lists. Due to the limited number of available donor kidneys, methods to reduce kidney rejection are crucial. Chronic kidney rejection can be difficult to identify and results in severe damage to the organ. Thus, studies have focused on discovering biomarkers to help predict chronic rejection. B cells have been implicated in chronic rejection. B cell subsets retain a state of homeostasis that can be disrupted by disease state and type of therapy. We hypothesized that nonmemory B cell subset homeostasis will be altered in kidney transplant patients under thymoglobulin and kidney maintenance therapy. Kidney transplant patients received low dose thymoglobulin. Maintenance immunosuppression consisted of tacrolimus, MMF, and prednisone. PBMCs and serum were collected from healthy individuals (n=25), pre-Tx (n=53), post-Tx 1 month (n=54), post-Tx 3 months (n=47), post-Tx 6 months (n=38), and a year post-Tx (n=19). PBMCs were assessed using 7-color flow cytometry and FlowJo Software. Serum BAFF (B cell activating factor) levels were measured using ELISA. Prism statistics software (GraphPad) was used to assess statistical significance. B cell subset proportions and BAFF levels were assessed using one-way ANOVA and Tukey's multiple comparisons test. Pearson correlation coefficient test was used between B cell subsets, BAFF, individual therapy, and kidney function. Both pre-Tx and post-Tx up to 6 months showed significantly altered B cell subset proportions in nonmemory B cell populations T1, T2, and FM when compared to healthy controls. BAFF levels differed between pre-Tx and post-Tx timepoints. Maintenance therapy and kidney graft function correlated with altered B cell subsets. Disrupted B cell homeostasis may promote the production of donor specific antibodies that can lead chronic rejection. Our preliminary results provide insights into which nonmemory B cells are altered in kidney transplant patients under thymoglobulin and maintenance immunosuppression.

NATHANIEL GEORGE MAMBO

GUEST PARTICIPANT 2016



To truly live life is to be happy and healthy, and everyone is entitled to this natural right. However, challenges arise because not everyone faces the same obstacles when it comes to achieving wellness in health and happiness. Improvement of health can come not only from healthcare but at all stages. Currently, I believe I can contribute to this endeavor as a scientist, conducting research to possibly help the lives of other people, developing solutions before they receive them.

I am a senior biology major at California State University, San Bernardino, working through the California Institute for Regenerative Medicine (CIRM) with Dr. Kimberly Payne to study the effects of the cytokine TSLP on a type of B-cell precursor leukemia. My earlier research experience includes working with Dr. Sally McGill, analyzing GPS site velocities of local fault lines to infer their slip rates through the PRISM program at CSUSB. I have also worked under Dr. David Rhoads at CSUSB studying the regulation of nuclear gene expression by mitochondria in plants.

My current research is of great interest because it is a health disparity with a high chance of relapse, affecting mostly Hispanic children with Native American ancestry. I want to improve the health of all groups and feel I can make an impact by studying this deadly leukemia at the Center for Health Disparities and Molecular Medicine. I ultimately want to go to medical school to impact lives on a personal level as a physician.

TSLP CYTOKINE EFFECTS ON CELL SURVIVAL IN B-CELL PRECURSOR LEUKEMIA

Nathaniel George Mambo, Cornelia Stoian, Kimberly Payne

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The cytokine TSLP stimulates *in vitro* proliferation of human fetal B cell precursors; however, its *in vivo* role during normal human B lymphopoiesis is unknown. The overexpression of the TSLP receptor component CRLF2 results in B-cell precursor acute lymphoblastic leukemia (CRLF2 B-ALL), implicating the importance of the TSLP-CRLF2 pathway in leukemogenesis. When TSLP binds, the receptor initiates downstream JAK2/STAT5 and PI3/AKT/mTOR pathway activation. Activation of these pathways is associated with oncogenesis and has been associated with increased cellular proliferation and survival. Protection from apoptosis is also an important cellular mechanism in the development of leukemia, and TSLP is implicated to lead to changes in the regulation of apoptosis. The activation of enzymes known as caspases is an early event in the process of apoptosis resulting in cleavage of protein substrates and subsequent disassembly of the cell. Activation of caspase-3/7 will provide a method of measuring TSLP-induced apoptosis in CRLF2-B-ALL cell lines. Human CRLF2 B-ALL cell lines (MUTZ-5 and CALL-4) were cultured with or without TSLP. Apoptosis in each cell line was evaluated by flow cytometry using assays that measure caspase-3/7 activity by cleaving a peptide's substrate. Our data show that cell survival decreases in both MUTZ-5 and CALL-4 cell lines after TSLP treatment. TSLP also increased the percentage of apoptotic cells in both cell lines. MUTZ-5 cells showed up to a 2-fold increase in the percentage of cells with caspase-3/7 activation while CALL-4 showed up to a 5-fold increase after 3 days in TSLP treatment. Our data suggest that TSLP stimulates caspase-3/7 activation in CRLF2 B-ALL cells under *in vitro* conditions, suggesting that TSLP-treated leukemia cells are more likely to undergo cell death by apoptosis. Future studies include using known apoptosis inducers to treat cells as a positive control to measure apoptosis in CRLF2 B-ALL. Caspase activation in normal B cell progenitors will also be evaluated.

PIERCE JAMES MCCARTHY

GUEST PARTICIPANT 2016

I am currently in my senior year at California State University, San Bernardino, and will be graduating with a double major in biology and psychology. I have volunteered as a clinical care health scholar at Riverside Community hospital for the last two years. During this program I received the exemplary service award while volunteering on the cardiac catheter lab floor. I also currently teach as a supplemental instructor for my university's introduction to cellular biology course. These experiences have taught me the value of helping others as well as how to be a leader.

I currently work as an intern in Dr. Kimberly Payne's lab through a program funded by the California Institute of Regenerative Medicine. The lab's main focus is on a specific type of high-risk leukemia called B cell acute lymphoblastic leukemia with overexpression CRLF2 (CRLF2 B-ALL). Specifically, my work focuses on the activation of the CRLF2 receptor by a cytokine called Thymic Stromal Lymphopoietin (TSLP) and its effect on Bcl-2 family pro-death molecule expression. Working in Dr. Payne's lab has not only taught me valuable lab techniques but also has shown me the value of having a multi-faceted team working on a critical issue.

My future aspiration is to work in the medical field and be an overall well rounded physician. I will be applying to medical school next year and hope to specialize in pediatrics. I always enjoy working with kids and would love to help keep them healthy.

BCL-2 FAMILY PRO-DEATH PROTEIN EXPRESSION IS REGULATED BY THE TSLP CYTOKINE IN B-CELL PRECURSOR LEUKEMIA

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The cytokine TSLP stimulates *in vitro* proliferation of human fetal B cell precursors; however, its *in vivo* role during normal human B lymphopoiesis is unknown. Genetic alterations that cause overexpression of the TSLP receptor component CRLF2 lead to B-cell precursor acute lymphoblastic leukemia (CRLF2 B-ALL). When TSLP binds, the receptor initiates downstream JAK2/STAT5 and PI3/AKT/mTOR pathway activation. Their downstream targets include members of the Bcl2 family. Specifically, our goal was to look at pro-apoptotic Bcl-2 family members and TSLP's effect on these proteins. This protein family is a key regulator of cell survival as well as all types of cell death. Human CRLF2 B-ALL cell lines (MUTZ-5 and CALL-4) were cultured with and without TSLP at a concentration of 15 ng/ml and evaluated at different time points for expression of Bcl-2 family proteins by flow cytometry. Viability of cells was also determined using a fixable viability dye. Our data show that TSLP prompts an increase in the Bcl-2 family pro-death proteins Bad, Bak, Bim and Bax in both cell lines. A reduction in cell numbers was seen for the TSLP treated population when compared to the non-treated population. The data suggest that under *in vitro* conditions, TSLP can stimulate CRLF2 B-ALL cells to express higher levels of pro-death molecules. However, the ability of pro-death Bcl-2 family proteins to stimulate cell death are antagonized by Bcl-2 pro-survival proteins. Therefore, it is very important to know the outcome of future studies to evaluate TSLP effects on Bcl-2 pro-survival proteins. TSLP has also been shown to have an important role in the production of normal B cell progenitors. We will conduct studies that will evaluate normal B cell growth and how TSLP treatment affects Bcl-2 family proteins in normal B cell progenitors. Also, future studies will be done to determine the effect of TSLP on Bcl-2 family protein expression in normal and malignant B cell progenitors in an in vivo model.

JAMES RAYMON WESLEY MCMULLEN

GUEST PARTICIPANT 2016

I grew up in a small town in New Mexico, the son of medical doctors. My father was a radiologist. His mission was to provide healthcare to an underserved community which he did for more than 25 years. I grew up seeing what service meant as my dad worked hard every day and on many holidays. I was inspired to help people, too, and went to college with this still vague and nascent mission. In 2012, I graduated with a BS in biology, a minor in chemistry, and with honors from Southwestern Adventist University in Texas. In college, I was still deciding what I wanted to do. I slowly realized how much I love ideas. I decided to pursue a PhD and was accepted into the Loma Linda Integrated Biomedical Graduate Studies Program.

I love ideas. Science was originally called "natural philosophy" and it still retains much of its roots. Theories do not emerge from the data, contrary to what Sir Francis Bacon would suggest. Numbers on a page or images will not spontaneously grow into a theory like some sort of primordial ooze. A theory can emerge when a researcher reads data and detects a pattern, the theory developing by the researcher's interpretation. A theory can also emerge simply from a researcher working with known facts, identifying gaps in the scientific knowledge, and adding some logical assumptions, axioms, postulates, etc., to create a scientifically testable idea that explains and expands upon the gaps in scientific knowledge. Scientific theory, as a product of human creativity, is tremendously engaging.

I am currently working on a biochemistry doctorate degree, conducting research in the lab of Dr. Nathan Wall on peritoneal carcinomatosis biomarkers.

COLORECTAL CANCER METASTATIC BIOMARKERS IN SERUM EXOSOMES: MECHANISM ELUCIDATION

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Peritoneal Carcinomatosis (PC) is carcinoma, epithelial cancer growth along multiple regions of the peritoneal surface. PC often originates from visceral organ metastasis. One of the most common cancers that metastasizes to the peritoneum is colorectal cancer (CRC). CRC can also metastasize to the lungs and liver. The reasons why CRC metastasizes to specific organs are unknown. In order to begin understanding the mechanisms of CRC metastasis to specific organs, this study will correlate the presence or absence and expression level of cancer proteins and RNAs with cancer metastasis. Further, the examined biomarkers will be contained within blood-born packages, exosomes, and may be useful as a general screening tool for the presence of CRC and organ metastasis. Exosomes, 30-150 nm lipid bound vesicles that are released by cells, contain multiple biomarkers including proteins and RNA which reflect internal cellular processes. Exosomes protect their contained biomolecules from degradation by external enzymes making blood born exosomes ideal for diagnostic purposes. Exosomes from cancer patients will be enriched with ExoQuick™ then lysed. Contained proteins will be examined with Mass Spectrometry and contained RNAs will be examined with a TaqMan low density DNA array. By comparing differences in exosomally contained biomarker expression levels between non-metastatic CRC, PC metastatic, and liver metastatic CRC, the internal cellular processes that facilitate specific organ metastases can begin to be elucidated.

STEPHANIE MERLOS

GUEST PARTICIPANT 2016

Three years ago I changed my major from nursing to chemistry when I took the class at La Sierra University in Riverside, CA. My professor Dr. Allard taught the class so well I was intrigued in every class to learn more about chemistry. I am now a senior and plan to graduate this upcoming winter.

At La Sierra University, I collaborated in a research project with the archaeology department to provide quantitative analysis for their donated artifacts from Jordan. I presented this research at my senior seminar Spring 2016.

This is my first summer at Loma Linda University as a volunteer in Dr. Perry's lab. We are currently working on electro-spun catalyst fibers and the degradation on the pesticide methyl parathion. I am grateful for this opportunity and learning about not just the research I am working on but also the research of others in the lab. Although I have done research in the past, this is a great experience because I have an idea of how intense research truly is.

In the future, I wish to pursue a career in pharmaceutical research. I wish to help those who are in need of pharmaceuticals on a daily basis live happier and comfortable lives.

UPLC AND LC-MS METHOD DEVELOPMENT FOR ANALYSIS OF PESTICIDES IN AQUEOUS SOLUTIONS AND PRELIMINARY CATLYTICAL DEGRADATION KINETICS USING FIBROUS NANO-FIBERS

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Persistent organophosphorus compounds (OPCs) comprise a class of environmental pollutants found in flame-retardants, plasticizers, pesticides, and remaining stockpiles of nerve agents present in military arsenals. In contrast to OP nerve agents, the use of OP pesticides are of global concern because of their widespread agricultural use and subsequent loosely regulated environmental monitoring. Objectives of the proposed work are to formulate mechanistic surface-mediated models of OPC degradation. Development of an efficient catalytic system for organophorus degradation still requires improvements in theory, synthesis, and environmental testing. This proposal will provide 1) an atomistic, mechanistic understanding of organophosphorus hydrolysis chemistry and surface-mediated catalysis and the subsequent phosphorus transfer between pools, and 2) the molecular basis of how microbes convert non-bioavailable to bioavailable phosphorus. The atomistic model developed for the model pesticide may be applied to other OPC degradation schemes. Moreover, this research should provide a pathway for large-scale, cost effective remediation pesticides in surface water in agricultural settings.

VERIAH VIDALES

GUEST PARTICIPANT 2016

When I first participated in the MTP program in 2012 with Dr. Carlos Casiano, I was finishing my 4th year of medical school at Montemorelos Adventist University in Mexico. Little did I know that I would be returning and getting involved in the area I am most passionate about: pediatrics. Being part of research has not only opened my eyes to valuing the efforts of many scientists, but I see a need for my personal involvement to create change in managing and educating patients.

Currently I work with a dynamic and dedicated group who are compassionate and constantly striving so hours in the lab translate into saving lives. One who has impacted me and to whom I am thankful is Dr. Casiano, an invaluable mentor and the reason why I now love research. He has graciously given me tools for excellence, believed in me, and guided me. I am also grateful to my mentor Dr. Kimberly Payne because she has a singular passion and vision to serve others which she freely transmits with much joy and wisdom.

My dream to become a pediatrician has been enriched by my experience here at CHDMM. God has guided my steps and gifted me with a dream to serve the underserved community in Loma Linda. The responsibility of every gained experience is to dispense it to others to the best of one's ability. This is what I strive to do in each present and future endeavor.

THE EFFECT OF TSLP ON THE EXPRESSION OF SOCS1 AND SOCS3 IN HIGH RISK B-ALL

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Although most pediatric B-cell acute lymphoblastic leukemias (B-ALL) are highly responsive to standard chemotherapy, the high-risk subset that do not respond well still account for the most childhood cancer deaths. Hispanic/Latino children are more likely to develop high-risk B-ALL than non-Hispanics, and when they do, they are 39% more likely to die. We know that some of this chemoresistance is due to pathogenic mutations. One such mutation increases the expression of cytokine receptor-like factor 2 (CRLF2) in leukemia cells and it is known as CRLF2 B-ALL. Binding of this receptor by its ligand TSLP activates the JAK/STAT5 signaling pathways which leads to the expression of genes promoting cell survival and proliferation. SOCS (suppressor of cytokine signaling) is a family of regulatory proteins that inhibit the TSLP-induced JAK/STAT5 pathways, thereby limiting its changes in gene expression. It is unknown whether TSLP-induced activation of CRLF2 B-ALL cells induces SOCS expression. Our studies examined whether TSLP increases SOCS1 and SOCS3 protein expression in CRLF2 B-ALL cells and, if so, whether this change is dynamic. This will help us understand SOCS's potential to inhibit the survival and proliferation of CRLF2 B-ALL cells. We examined the expression of SOCS1 and SOCS3 proteins *in vitro* using two CRLF2 B-ALL cell lines (MUTZ-5 and CALL-4) cultured with and without TSLP. SOCS protein expression was evaluated over time (2-7days) using flow cytometry. We found that TSLP induced increases in SOCS1 and SOCS3 expression in both CRLF2 B-ALL cell lines, which indicates these leukemia cells have mechanisms to overcome the SOCS effect. These mechanisms will help our understanding of the cancer's *in vivo* physiological environment. Studying the role of SOCS proteins in high-risk B-ALL oncogenesis will help us target these cancer cells and, ultimately, the health disparity affecting Hispanic/Latino children.

*Both authors did equal amounts of work on this research study.

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