UCI Sue & Bill Gross Stem Cell Research Center

11th Annual Stem Cell Science Symposium
Wednesday, January 17, 2024

Gross Hall, 4001 Thorp Conference Center
845 Health Sciences Rd, Irvine, CA 92617
9:00 AM to 6:00 PM

AGENDA

9:00 AM	Arrive, Mini Continental served
9:30 AM	**Welcome and Introduction** *Aileen Anderson, PhD*
9:40 - 10:20 AM	**"Pathogenic Mechanisms of Clonal Hematopoiesis-Associated Epigenetic Modifier Mutations"** *Minji Byun, PhD*
10:20 - 10:40 AM	**"Teaching Neurons—Functional Programming of Human Stem-Cell Derived Neuronal Networks with External Cues"** *Shravan Thaploo, Graduate Student Researcher in Dr. Zoraan Nenadic's lab, Stem Cell T32 Trainee*
10:40 - 11:00 AM	Break (20 Minutes)
11:00 - 11:20 AM	**"Cell Replacement and Visual Improvement by CRX-GFP hESC-derived 3D Retina Organoids in an Immunodeficient Retinal Degenerate (RD) Rat"** *Bin Lin, PhD, Assistant Project Scientist in Dr. Magdalene Seiler's lab*

11:20 - 11:40 AM	**"Engineering iPSC-derived Microglia to Deliver Therapeutics to the Brain"** *Jean Paul Chadarevian, Graduate Student Researcher in Dr. Mathew Blurton-Jones's lab*
11:40 AM - Noon	**"Role of Regulatory T Cells in Graft Versus Leukemia (GVL) and Graft Versus Host Disease (GVHD) Post Allogenic Hematopoietic Stem Cell Transplant (HSCT) for High Risk Acute Leukemias"** *Rishikesh Chavan, MD from Children's Hospital of Orange County*
Noon - 1:00 PM	Lunch Buffet (1 hour)
1:00 - 2:00 PM	***"*The Influence of Adaptive Immunity on Regenerative Therapies for Autoimmunity and Autoinflammatory Diseases of the CNS*"*** *<u>Keynote:</u> Craig Walsh, PhD*
2:00 - 2:20 PM	Break (20 Minutes)
2:20 - 3:00 PM	**"Mitochondrial RNA Granules in Huntington's Disease: A Synaptic Perspective"** *Charlene Smith, PhD, Assistant Project Scientist in Dr. Leslie Thompson's lab*
3:00 - 3:20 PM	**"A Predictive Mitochondria Fitness Framework for Assessing Neural Stem Cell Therapeutics"** *Atena Zahedi, PhD, Postdoctoral Scholar in Dr. Aileen Anderson's lab*
3:20 - 3:40 PM	**"Determining the Role of Adhesome Protein Signaling in Lung Cancer Metastasis"** *Ashley Urrutia Avila, Graduate Student Researcher in Dr. Timothy Downing's lab*
3:40 - 4:00 PM	**"Transducer Biomaterials for Stem Cell-Based Tissue Engineering"** *Herdeline Ann M. Ardoña, PhD*
4:00 - 6:00 PM	Poster Session and Holiday Celebration/Networking Session
5:30 PM	*Award Ceremony*

<u>MEET THE SPEAKERS</u>

Keynote Speaker: **Craig M. Walsh, PhD**

Dr. Walsh has a long-term interest in immunological self-tolerance and the mechanisms that restrict T cell autoreactivity. One major focus of the Walsh lab is on the disease multiple sclerosis (MS), a devastating autoimmune disease in which T cells enter into the central nervous system (CNS) and attack myelin. This leads to loss of myelin on axons, resulting in a profound impairment in neuronal function that can lead to paralysis, blindness and potentially death. Dr. Walsh's team has discovered that transplantation of neural stem cells (NSCs) into MS model mice leads to remyelination and clinical recovery, and this was found to depend on the recruitment of a special type of T cell called a regulatory T cell (Tregs). Recently, the Walsh lab has published that NSCs promote Treg recruitment into the CNS by their production of myelin and neural self-antigens. A key question that remains to be answered is how such Tregs participate in tissue regeneration following NSC transplantation. A second area of investigation is related to the role of T cells in Alzheimer's Disease (AD), and the Walsh lab has discovered that AD-prone mice develop AD-like pathologies that are exacerbated when T cells are lacking. Along with results from other groups, these findings support the hypothesis that T cells play complex roles in both prevention and exacerbation of pathologies associated with AD progression.

Herdeline Ann M. Ardoña, PhD

Herdeline Ann M. Ardoña is originally from Valenzuela City, Philippines. She received her B.S. in Chemistry from the University of the Philippines Diliman in 2011. In 2017, she completed her Ph.D. in Chemistry at Johns Hopkins, with fellowship support from Schlumberger Foundation and Howard Hughes Medical Institute. She then moved to Harvard University as an ACS Irving S. Sigal Postdoctoral Fellow in the Disease Biophysics Group at the Wyss Institute for Biologically Inspired Engineering and John A. Paulson School of Engineering and Applied Sciences. She is currently an Assistant Professor at the UC Irvine Department of Chemical and Biomolecular Engineering, with joint appointments at the UCI Department of Chemistry and Department of Biomedical Engineering, and a member of the UCI Stem Cell Research Center.

Minji Byun, PhD

Dr. Byun received her bachelor's degree in Life Sciences from POSTECH, South Korea, and her Ph.D. in immunology at Washington University in St. Louis. She received postdoctoral training in human genetics of infectious diseases at Rockefeller University, New York. Dr. Byun was recruited to the Icahn School of Medicine at Mount Sinai, New York, as an assistant professor in 2016. She joined UCI in 2022 as an assistant professor in the Department of Microbiology and Molecular Genetics. Dr. Byun has a broad background in immunology, human genetics, and epigenetics. Her group uses human pluripotent stem cell-derived immune cells to study pathogenic mechanisms of inborn and acquired mutations affecting the immune system.

Shravan Thaploo, Graduate Student in Dr. Zoran Nenadic's Lab

Shravan Thaploo is pursuing an M.D./Ph.D. in Biomedical Engineering at UCI. He completed his B.S. in Neuroscience at The Ohio State University and previously worked as a research fellow at Harvard Medical School. Shravan grows stem cell-derived neurons and astrocytes on microelectrode arrays and trains them to recognize external brain signals and respond to them. Outside of lab, he enjoys Muay Thai boxing and riding his motorcycle. He plans to pursue a neurosurgery residency after finishing graduate school.

Bin Lin, PhD – Assistant Project Scientist in Dr. Magdalene Seiler's Lab

Dr. Bin Lin is an Assistant Project Scientist in Stem Cell Research Center at UCI. His expertise in neuroscience, including the studies of learning and memory, ischemia and chronic pain, and stem cell therapy, is documented by 23 publications (11 first author and 2 co-first author). After joining Dr. Magdalene Seiler's lab at UCI in 2016, he has been focusing on developing retinal-sheet transplants to improve the vision of blind people with advanced retinal degeneration, such as Retinitis Pigmentosa and age-related macular degeneration, which affect both photoreceptors and the retinal pigment epithelium (RPE). Currently, he is investigating the possibility that human embryonic stem cells (hESC) can be differentiated into retinal organoid sheets and after transplantation, can replace the degenerative host photoreceptors and improve visual function in retinal-degenerative animal models. As a senior researcher in the lab, he is actively involved in preparing grant applications and publication, and have mentored and supervised more than 75 undergraduate students

Jean Paul Chadarevian, Graduate Student in Dr. Mathew Blurton-Jones's Lab

Jean Paul Chadarevian is a PhD candidate of Neurobiology and Behavior at UCI. He completed his Bachelor of Science in Mathematics and Economics at UC San Diego and his Master of Science in Stem Cell Biology and Regenerative Medicine at University of Southern California. Jean Paul uses genetically modified human stem cell-derived microglia to study their therapeutic potential in chimeric animal models of neurodegenerative disease.

Rishikesh Chavan, MD from CHOC

Our current research focus at CHOC is on improving response to cellular therapies including Hematopoietic Stem Cell Transplant (HSCT) and chimeric antigen receptor -T (CAR-T) cells to maximize long term relapse free survival for childhood leukemias and lymphomas while minimizing adverse effects such as graft versus host disease (GVHD), cytokine release syndrome (CRS) and immune effector cell–associated neurotoxicity syndrome (ICANS), serious infections, and organ toxicities. To achieve these goals, we have implemented several research trials which include those from international consortia, phase 1 and 2 trials and investigator-initiated trials.
My current clinical, research, and administrative responsibilities as the Director of the Blood and Marrow Transplant Program in the Hyundai Cancer Institute and Associate Medical Director of Cell therapy Lab at Children's Hospital of Orange County (CHOC) along with academic affiliation as H.S. Clinical Associate Professor of Pediatrics at UCI, gives me a unique opportunity to facilitate basic, translational and clinical research involving the application of immunotherapies through clinical trials to ensure successful and sustained remission in patients with high risk leukemias and lymphomas. I endeavor, as a researcher, to evaluate ideas and test hypotheses related to better understanding immunomodulation as it is related to cancer treatment response and, in doing so, design clinical trials combining immunotherapies for the right cohort of patients to advance the field of stem cell transplant and cancer immunotherapy.
As a principal investigator of our Regulatory T cell research lab at CHOC we have an ongoing investigator-initiated clinical research project titled "Role of regulatory T cells in predicting outcomes of stem cell transplantation." This project is funded successfully through philanthropic monies, internal funding mechanisms, and an Infrastructure Award from St. Baldrick's Foundation.

Atena Zahedi, PhD - Postdoctoral Scholar in Dr. Aileen Anderson's Lab

Stem cell activity and function are critical in development, aging, disease, and injury. Transplantation of human neural stem cells (hNSC) to replace damaged tissues in traumatic injuries and neurodegenerative diseases has shown great promise in pre-clinical studies and early clinical trials. hNSC transplantation can contribute to repair by generating new CNS cells, as well as secreting neuroprotective factors. However, the heterogeneity in the efficacy and survival of different human NSC lines after transplantation is vast, and there is an unmet need for corresponding data in different clinical models. Spinal cord injury (SCI) causes nerve fiber degeneration and loss of motor and sensory functions, and globally affects over 27 million people. Individual costs of cervical SCI can exceed $1M/year, in addition to the economic costs due to loss of work for SCI individuals and primary caregivers. Combined with the lack of SCI therapeutics, these data highlight significant unmet medical and quality of life needs. SCI is marked by a secondary injury phase, characterized by stress due to elevated levels of reactive oxygen species (ROS), secreted inflammatory factors, and mitochondria dysfunction. These factors are shown to impair NSC repair potential (efficacy) by affecting functions such as cell division and differentiation. Mitochondria are also vital for providing the energy demands (bioenergetics) of cells during times of high energy demand such as during stem cell differentiation and migration. However, mitochondria are sensitive to stress, where overproduction of ROS can lead to mitochondrial dysfunction, degradation, and eventual exhaustion. I propose a model where key mitochondria fitness traits (MFTs) can determine: 1) the efficacy of hNSC line after transplantation into a SCI model, and 2) the outcome of potential mitochondrial drug candidates. To test this hypothesis, I used human NSC UCI lines where one set of lines exhibits efficacy after transplantation into SCI models, while a second fails this test. I am also developing a novel mitochondria DNA (mtDNA)-targeted CRISPR/Cas reporter system for stable tracking of mitochondria transfer (MT) from transplanted NSCs in vivo and studying the effect of mitochondria uptake on host cells. Not many studies have investigated the mechanisms of how stem cell line intrinsic mitochondria characteristics are related to functional recovery from injury and neuroinflammation. This lack identifies a critical gap in knowledge in the stem cell transplantation field. I ultimately aim to elucidate the role mitochondria fitness and transfer in the efficacy of stem cell lines and develop new mitochondria-based therapeutic approaches to advance clinical trials for traumatic injuries and neurodegenerative diseases.

Ashley Urrutia Avila, Graduate Student in Dr. Timothy Downing's Lab

Ashley Urrutia Avila is a PhD candidate of Biomedical Engineering at UCI. She completed her Bachelor of Science in Biomedical Engineering at UC Irvine. Ashley is currently investigating the role of adhesome protein signaling in lung cancer metastasis through the acquisition of lung cancer stemness markers.

Charlene Smith, PhD – Assistant Project Scientist in Dr. Leslie Thompson's Lab

Dr. Charlene (Charlie) Smith is a Project Scientist in the laboratory of Leslie Thompson at UCI. She carried out her PhD studies at Cardiff University, helping to optimize a protocol to differentiate induced pluripotent stem (iPS) cells to medium spiny neurons (MSNs), the cells which are most vulnerable in HD. Charlie then applied this protocol to her postdoctoral work in Dr. Thompson's lab to model HD in a dish and study underlying mechanisms that are altered in HD. She received funding for her postdoctoral project from the Hereditary Disease Foundation using iPSCs that had been generated by the HD iPSC Consortium. She identified neurodevelopmental deficits and structural abnormalities in mitochondria of HD iPSC neurons. She also developed a strategy for CRISPR-mediated knockdown of PIAS1, an E3 SUMO ligase that enhances the addition of a SUMO protein onto HTT and other cellular proteins and demonstrated neuroprotective effects on HD iPSC neurons. She is continuing this work in 3D mini brains (striatal and cortical organoids). She served as the Chair of the Gordon Research Seminar for CAG triplet repeat disorders in 2019.