2024

Research Internship Poster Symposium and Ceremony

Hosted by the Center for Learner Diversity and Inclusion
and the Knight Cancer Institute

August 16, 2024

1 - 3:30 p.m

Knight Cancer Research Building Auditorium

OHSU

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Program Schedule

1 P.M. | AUDITORIUM

WELCOME

Andrew Justicia
Diversity Recruitment and Retention Program Manager

Melanie Bennett
Knight Cancer Institute Senior Manager

KEYNOTE SPEAKER

Tomas Lazo, M.D.
Vice Chair/Senior Director of Diversity, Equity, and Inclusion-OHSU APOM

ACKNOWLEDGEMENT OF INTERNS AND MENTORS

- Biomedical and Bioinformatics Research Internship and Training Experience
- Chemical Physiology and Biochemistry Summer Undergraduate Research Program
- Ted R. Lilley CURE Program
- Equity Research Program
- School of Dentistry Research Internship Program
- STEMPrep Internship Program
- Vollum/NGP Summer Undergraduate Program

1:30 P.M. | ATRIUM AND HALLWAY

POSTER SYMPOSIUM

3:15 P.M. | AUDITORIUM

AWARDS PRESENTATION

Internship Program Coordinators

CLOSING REMARKS

Hue Pham
CURE intern

Lisa Truong
Equity intern

Lilly Granados
CPB-SURP Intern

Biomedical and Bioinformatics Research Internship and Training Experience

The Biomedical and Bioinformatics Research Internship and Training Experience (B-BRITE) at the Knight Cancer Institute offers undergraduate interns a chance to immerse themselves in an 8- to 10-week summer research experience working directly with established mentors in various fields of biomedical research, including, but not limited to, cancer biology, immunology, cell and developmental biology, computational biology, and biomedical engineering. Interns attend weekly education sessions covering topics from cutting-edge technologies and choice of model system to career development. B-BRITE is supported by the Knight Cancer Institute, with additional contributions from BCCPC, CEDAR, the University of Oregon's Clarks Honors College, and the URISE program at University of Alaska, Anchorage.

Saiman Adhikari

Gettysburg College

MENTORS Daniel Chandra, Bernhard Alber, Jennifer Saultz, Ph.D. (PI)

Understanding the Role of Tumor Microenvironment on NK Cell Maturation

AML is a disease with a poor prognosis with the 5-year survival rate of only 29.5%. CD56 expression on AML has an even poorer prognosis and could influence the NK cell resistance against AML. My research focuses on understanding the interplay between AML blasts and NK cells by focusing on CD56 expression via AHR pathway activation and the resulting phenotypic changes in NK cells and AML blasts.

Janna Block-Swanson

Boston University

MENTORS Megan Burger, Ph.D., Alyssa Granados

Optimizing systems to study the impact of antigen expression patterns on T cell responses in lung cancer

My research focuses on optimizing fluorescent protein-antigen fusion constructs to study immunodominance in lung adenocarcinoma. By tagging fluorescent proteins to cancer neoantigens, we can then distinguish between tumors expressing different antigens and track antigen migration to the lymph nodes. My work aims to analyze tumor burden from clonality experiments and identify the brightest fluorescent proteins (mScarlet, tdTomato, and dsRed) for use in our mouse model, providing insights into antigen-specific T cell responses and informing future immunotherapies.

Fedor Mikhailovich Chayka

University of Oregon

MENTORS Thuy Ngo, Ph.D., Rowan Callahan, Kenneth Riley, Elias Spiliotopoulos, Travis Moore

Batch effect correction in cell-free RNA sequencing data for detection of pancreatic ductal adenocarcinoma

Cell-free RNA (cfRNA) has shown promise as a biomarker for early cancer detection. Here, we developed a statistical model to differentiate cancerous from non-cancerous conditions in patients at high risk of pancreatic ductal adenocarcinoma. To address the technical variation within cfRNA data, we investigated strategies for normalization and batch effect correction.

Steve Cherry

University of Alaska Anchorage

MENTORS Patrick Flynn, Ph.D, Evan Lind, Ph.D. (PI)

Development of a Triple-Reporter T Cell with Antigen Specific TCR for AML

Develop a triple-reporter T cell line and remove the endogenous TCR, then add a TCR specific to an HLA-antigen complex found in patient leukemia samples. Assess the capacity of the modified T cells to bind the HLA-antigen complex by evaluating transcription factor dependent fluorescence using multi-parameter flow cytometry. Ultimately assess the ability of the reporter T cells to kill antigen expressing AML cells.

Annika Deazley

Pacific Lutheran University

MENTORS Kayla Nguyen, Naoki Oshimori, Ph.D.

The role of cancer stem cell-specific genes in cytoskeletal remodeling for invasive tumor progression

Squamous cell carcinoma (SCC) is the second most common type of skin cancer with a high recurrence rate after surgery, likely due to disseminated tumor cells with long-term tumorigenic potential, or cancer stem cells (CSCs). It remains unclear how CSCs become highly motile to invade the surrounding stromal tissues. Focusing on epigenetically regulated genes, we investigate the CSC-specific cytoskeletal remodeling factors to understand the mechanism of tumor cell invasion, which may lead us to the discovery of a novel target to prevent tumor recurrence.

Cydney Hunt

Trinity College (Conn.)

MENTORS Michelle Ozaki, Elise de Wilde, Reuben Hoffmann, Ruthanne Zareyna, Pepper Schedin, Ph.D. (PI)

Expression Levels and Localization Patterns of COX-2 and SNO-COX-2 During Mammary Gland Involution in Mice

Cyclooxygenase-2 (COX-2) and its nitrosylated form (SNO-COX-2) are inflammatory enzymes linked to increased tumor aggressiveness during weaning, making them a marker and therapeutic target for breast cancer. The Schedin lab recently discovered that unmodified and nitrosylated COX-2 express different localization patterns in human breast tissue. Using a mouse mammary gland model, we used immunohistochemistry to explore how unmodified and nitrosylated COX-2 change in the mouse mammary gland across a reproductive cycle and in a postpartum breast cancer model.

Madelyn Krebs

Oregon State University

MENTORS Margaret Haerr, Kyle Gribbin, B.S., Katelyn Byrne, Ph.D.

Evaluating the Baseline Vasculature of T Cell High (TCH) and T Cell Low (TCL) Pancreatic Ductal Adenocarcinoma (PDAC) Tumor Microenvironments

Using immunofluorescence, we aim to determine how the physical and functional attributes of vasculature in pancreatic ductal adenocarcinoma (PDAC) tumors differ between high and low levels of T cell infiltration in the tumor microenvironment.

Alex Lapadat

Amherst College

MENTORS Andrew Ashford, Emek Demir, Ph.D.

Predicting Cancer-Associated Mutations in Patient-Derived AML Samples Using Machine Learning

Our lab developed a novel, simplified bioinformatics method for detecting cell-level mutations from RNA-sequencing counts, enhancing our understanding of AML mutations and facilitating cell-level genomic profiling. My work focused on validating these findings and techniques by comparing our machine-learning predictions with results obtained from SCmut, an existing statistical model that uses bulk RNA-seq-derived signatures to predict cancer-associated mutation status in single cells using scRNA-seq. Given the abundance of pre-existing scRNA-seq datasets, successfully implementing this method could make studying cancer genomics more accessible from a technical and economic perspective, as current approaches based on single-cell RNA and bulk DNA sequencing are computationally intensive and challenging to analyze.

Ethan Lu

University of Michigan

MENTORS Ranish Patel, M.D., Abby Gillingham, Melissa Wong, Ph.D. (PI)

Expression of ZG16 and Muc2 Phenotypically Discriminates between Colorectal Adenomas and Colorectal Cancer on Circulating Hybrid Cells

Circulating Hybrid Cells (CHCs) are cell fusions between tumor cells and macrophages that retain the properties of both cell types. In Colorectal Cancer (CRC), CHCs can be enumerated to track disease burden, but enumeration is difficult to use to differentiate between CRC and colorectal adenomas, or advanced precancerous lesions that lead to CRC. Thus, my project involves doing a literature search on protein biomarkers that express differently between CRC and colorectal adenomas, and using immunofluorescent staining to show differences in protein expression between CHCs originating from CRC and colorectal adenomas.

Liliana McClain

Seattle University

MENTORS Kirsten Stefan, Ph.D., Wendy Li, M.S, Jee Min Lee, Charles Dibb

Evaluation of drug combination effect of SU056 and doxorubicin in osteosarcoma

The aim of this project was to evaluate the efficacy of combining standard-of-care chemotherapy doxorubicin with SU056 to treat osteosarcoma. One of the most prevalent challenges in osteosarcoma treatment is the development of drug resistance, which is strongly associated with the expression of the cold-shock protein YB-1. SU056 is a newly-developed small molecule compound that hinders cancer progression by YB-1 inhibition.

Kaeli Miller

Oregon State University

MENTORS Rashi Yadav, Ph.D., Josh Moreau, M.D.

The Tumor Microenvironment and B Cell Modulation in Dermatofibrosarcoma Protuberans

In this study, I explore how the tumor microenvironment in Dermatofibrosarcoma Protuberans (DFSP) influences B cell responses. The focus is on how B cells are affected by normal fibroblasts and DFSP cells, examining differences in immune-regulating cytokine production, B cell proliferation, and phenotypes. The aim is to uncover the mechanisms by which DFSP tumors create an immunosuppressive environment.

Pranav Mishra

Dickinson College

MENTORS Stephen Coleman, Ph.D., Nicole Szczepanski, M.S., Galip Gürkan Yardimci, Ph.D. (PI)

Summarizing the transcriptomic landscape of a non-small cell lung cancer atlas via representative subset selection

In this presentation, we demonstrate our application of representative subset selection algorithms to a large integrated non-small cell lung cancer atlas of 186,223 cells profiled by single cell transcriptomic assays. In doing so, we select representative subsets of cells that only make up 2% to 10% of the full dataset. Upon profiling the properties of these subsets and recording the time required to select them, we show that our subsets are enriched in rare cell types and maintain the properties of the full dataset, effectively yielding an approach that allows us to summarize atlas-scale single-cell datasets into more computationally tractable subsets.

Caleb Moon

University of Oregon

MENTORS Jenny Wang, Ph.D., Joseph Shatzel, M.D., M.C.R

Visualization and Quantification of thrombosis formation in Euroset system A.L.ONE Extracorporeal Membrane Oxygenators

Extracorporeal Membrane Oxygenation (ECMO) is essential for critically ill patients, but device-related thrombotic complications remain a significant issue. To quantify thrombus deposition in ECMO oxygenators, we use a multimodal approach: collecting ECMO samples, using CT imaging and SEM to validate clot components, and employing automated image processing with deep learning. Our goal is to develop a method to evaluate the mechanism of oxygenator thrombosis.

Luisa Morgan

Reed College

MENTORS Andrew Emili, Ph.D., Jacob Porter, Ph.D.

DIAD: An Adsorption-Based Approach to Proteomic Drug Discovery

Proteomic drug discovery is a process in which the alterations to a protein's physical properties occurring in response to chemical treatment are utilized to assess the proteome-wide effects of novel pharmaceutical compounds. Here we present the DIAD assay, a variation of this process that exploits the changes in a protein's ability to adsorb to surfaces that occur following exposure to a chemical ligand in order to identify the proteins whose phenotypes are most significantly affected by a given compound.

Faithlyn Moss

University of Florida

MENTORS Victoria Schuster, Megan Ruhland, Ph.D.

Characterizing Immune Responses to Dual Antigen Uptake in Dendritic Cells: Implications for Cancer Immunity Cycle

The primary aim of this presentation is to monitor the immune response elicited by singular antigens or the co-uptake of multiple antigens through dendritic cell signaling. We are specifically investigating the inflammatory profile of dendritic cells in response to the co-uptake of antigens derived from pathogenic and commensal molecules across different dendritic cell populations. This study to conducted in vivo, with further analysis carried out using flow cytometry to characterize the inflammatory profile of dendritic cells on the basis of commensal and pathogenic bacteria.

Zobe Murray

Gonzaga University

MENTORS Zheng Xia, Ph.D., Ya-Mei Hu, Yi Zhang, and Tao Ren

Characterizing Fungal Community Landscape in Head and Neck Cancer: A Multi-Group ITS Sequencing Analysis

This study investigates the fungal microbiome associated with head and neck cancer by analyzing ITS sequences across distinct tumor, control, and normal groups. The presentation describes the bioinformatics pipeline developed for identifying fungal communities in patients with head and neck cancer and shares the results from the analysis of two ITS sequencing data sets as well as a prediction model for pathological group. Our findings aim to enhance the understanding of how fungal communities might contribute to the pathogenesis of head and neck cancer and facilitate the disease prediction.

Ashvin Nair

Brown University

MENTORS Melissa Wong, Ph.D. (PI), Nicole Giske

Differential Wnt signaling regulates different intestinal stem cell populations during development

Stem cell regulation in the gut is important for proper development, and two established gut stem cell populations are LGR5+ cells and Bmi1+ cells. We currently have a discrete understanding of these cell populations and can better how they are regulated by the non-canonical and canonical parts of the Wnt signaling pathway. To investigate the diverse roles of canonical and noncanonical Wnt signaling on Bmi1+ and LGR5+ stem cells during development, we utilized OMICS, murine modeling, and ex-vivo studies.

Nmesoma E. Onyejekwe

North Central College (Ill.)

MENTORS Teresa Zimmers, Ph.D., Sara Ota, Sephora Jean, Omnia Gaafer, Brittany Counts, Ph.D.

Investigating Osteopontin in pancreatic cancer cachexia

We discovered the upregulation of the Spp1 gene in our pancreatic cancer cachectic murine model, significantly in the epididymal white adipose tissue. This gene encodes the Osteopontin protein, which plays a role in bone remodeling, cell signaling, and protumorigenic roles in various cancers; however, its role in pancreatic cancer and cachexia is uncertain. Therefore, my project aims to ascertain the source, deposition, and, potentially, function of Osteopontin in the adipose tissue of our pancreatic cancer cachectic murine model using western blotting and immunofluorescence.

Johnathan Pang

Lewis & Clark College

MENTORS Haylie Helms, M.S., and Luiz Bertassoni, DDS, Ph.D.

Development of a Laser Assisted Bioprinting Method for the Rapid and Precise Patterning of Breast Tumor Microenvironment Cells

The tumor microenvironment (TME) is comprised of many cell types interacting to either promote or inhibit tumor progression. Current models used to study the TME have limited ability to control the spatial organization of these cells which has been proven to be a key contributor to clinical outcomes. Here we developed a method to rapidly pattern breast TME cells using laser assisted bioprinting with 100 µm resolution.

Koharu Sakiyama

University of California, Berkeley

MENTORS Zachary Sims, Young Hwan Chang, Ph.D. (PI)

Evaluating Multiplex Panel Reduction and Marker Imputation Through Downstream Analysis: Optimizing Performance with Panel Selection Strategies

Our lab has developed a computational model to optimize biomarker selection and imputation to achieve multiplexed tissue imaging with fewer biomarkers. This involves identifying an optimal set of reduced markers and using it to impute the remaining markers. My project compares the impact of human knowledge-driven versus data-driven selection of the reduced panel on our model's ability for biomarker imputation, cell phenotyping, and spatial analysis.

Anagha Shenoy

University of Illinois Urbana-Champaign

MENTORS Daniel Derrick, M.S., Laura Heiser, Ph.D.

Characterizing lineage relationships and spatiotemporal dynamics for agent-based models of multicellular systems

This project develops new features for an agent-based modeling framework, defining ancestral and spatial relationships between cells within the context of various multicellular systems, including normal tissue development and cancer. We aim to provide a complement and extension of experimental approaches to facilitate informed development of agent-based models of the tumor immune microenvironment in triple-negative breast cancer.

Haddi Sise

Pomona College

MENTORS Chloe Bowmann, B.S., Arslan Amer, Ph.D., Ellen Langer, Ph.D., Eric Carlson, Ph.D.

Investigating the Effect of KRAS in Pancreatic Ductal Cells on Neighboring Fibroblasts

Pancreatic ductal adenocarcinoma (PDAC) is the third leading cause of cancer-related deaths, with its desmoplastic and heterogeneous tumor microenvironment (TME) contributing to its lethality. The v-Ki-ras2 Kirsten rat sarcoma viral oncogene homolog (KRAS) mutations are an early event observed in 90% of PDAC cases which suggests that it is important in its development. We are interested in studying the effect of the KRAS mutation in pancreatic ductal epithelial cells on neighboring fibroblasts and their potential to become a part of the TME as cancer associated fibroblasts (CAFs).

Joey Tan

Yale University

MENTORS Sam Sivagnanam, Wes Horton, Nell Kirchberger, Eric Berens, Ph.D., Lisa Coussens, Ph.D., FAACR, FAIO (PI)

Using single cell spatial analytics on multiplex imaging data to characterize the architecture of breast cancer tumor microenvironments

Taking advantage of how multiplex imaging provides capabilities to analyze the single cell spatial context and architecture of tissue, we developed a tool to perform multiple spatial analyses on single cell multiplex data. We focused primarily on metrics such as cellular neighborhood analysis, mixing score, spatial distance, and spatial visualization to better understand immune infiltration in clinical human breast cancer tissues of different subtypes and treatments. Our results demonstrate the value in understanding spatial interactions of immune and tumor cells within the tumor microenvironment.

Phyo Theingi

Portland State University

MENTORS Maddy Tomasake, Thuy Ngo, Ph.D. (PI)

Liver pre-metastatic niche formation in the early stages of pancreatic ductal adenocarcinoma

For our project we will be focusing on how IL-6 signaling can help to prevent the development of PMN formation in PDAC and we will be focusing on signals for early detection markers to establish in vitro human models. We are interested in developing an in vitro model of the interaction between IL-6 signaling and hepatocytes during the early stages of liver PMN formation.
The reason we are interested in studying this is because PDAC cancer is very serious and we can't detect it at an early stage in humans and usually patients are found when a tumor has already spread out into their body. Our goal for this project is to study how tumor cell develop in early stage of PMN and our future goal is to find a way to treat PDAC cancer in early stage.

Kim Tu

Oregon State University

MENTORS Tanaya Shree, M.D., Ph.D. Riley Whalen, Hong Guo, M.D., Ph.D.

Investigating the role of B cell lymphoma costimulatory signals in the activation of T cells during CD3xCD20 bispecific treatment

The FDA recently approved CD3 x CD20 T cell engaging bispecific antibodies (bsAB) for the treatment of Diffuse large B cell lymphoma (DLBCL), one of the most common types of white blood cell cancer, yet the specific mechanisms of how bsABs activate T cells to kill cancer cells are still unknown. It is crucial to identify the factors limiting durable bsAB-mediated T cell activation in non-responding patients. In this project, we investigate if costimulatory molecules on B lymphoma cells are necessary to activate T cells optimally upon treatment with bsAbs by utilizing in vitro experimental models.

Aubrey Welburn

Clark Honors College, University of Oregon

MENTORS Jacob Raber, Ph.D., Alexandra Pederson, Abigail O'Niel

The Role of apoE Isoform in Olfaction in Mice

Changes in olfaction or anosmia are one of the first symptoms of Alzheimer's Disease (AD) and related dementia's (ADRD) and apolipoprotein E (apoE) isoform which exists in humans as three major isoforms, E2, E3, and E4 might play a role in this. This study aims to better understand the effects of distinct human apoE isoforms on olfaction using young human apoE targeted replacement mice and a newly developed olfactory test using a Hole Board assessing the ability of mice to detect a Novel odor or a Novel location of a familiar odor. To determine whether behavioral performance is associated with apoE isoform-dependent differences in neuronal activation, we use immunohistochemistry of the olfactory bulb, hippocampus, and cortex to analyze cells positive for the immediate early gene cFos.

Natnael Yaregal

Bates College

MENTORS Rachel Huynh, Julien Carson-Wallace, Amy Morgan, M.D., Zachary Hay, Ph.D.

Investigating the Impact of Androgen Receptor on T-regulatory cells (Tregs)

My poster presentation will focus on investigating the role of Androgen Receptor (AR) in the differentiation and suppressive capabilities of T-regulatory cells (Tregs). Using a mouse model with T cell-specific AR knockout (ARKO) and wild type (WT) controls, we aim to understand how AR deficiency affects Treg differentiation from splenic CD4+ T cells and their ability to suppress immune responses. The findings may provide insights into AR's potential implications for cancer progression and immunotherapy.

Chemical Physiology and Biochemistry Summer Undergraduate Research Program Interns

Chemical Physiology and Biochemistry Summer Undergraduate Research Program (CPB-SURP) is a 9-week summer internship designed to provide undergraduate students with hands-on training in innovative research in the disciplines of chemical biology, biochemistry, structural biology and physiology, conducted at a leading academic health center in the beautiful Pacific Northwest.

Sydney Blurton

Oregon State University

MENTORS Maya Fowler, Andrea DeBarber, Ph.D. (PI)

Characterization of Biomarkers in Cerebrotendinous Xanthomatosis and their Potential Utility for Diagnosis and Monitoring Therapy

Cerebrotendinous xanthomatosis (CTX) is a genetic neurodegenerative condition where a deficiency in the CYP27A1 enzyme results in a lack of cholesterol derived oxysterols and an accumulation of cholestanol and other metabolites. Both the lack of certain molecules and the accumulation of cholestanol and other potentially toxic metabolites may play a role in the pathophysiology of disease. The goal of this project was to better characterize the metabolic profile of disease in plasma from CTX patients (determining both deficient and accumulated metabolites) and explore the potential utility of these metabolites for diagnosis and to monitor therapy.

Lilly Granados

University of Oregon

MENTORS Berit Blume, Ph.D., Carsten Schultz, Ph.D. (PI)

Synthesis and Characterization of Bifunctional Fatty Acids

Lipid molecules are fundamental in the formation of membranes and cellular response to signaling. Despite their crucial role, tools for identifying lipid interactions in vivo are limited. In our project, we synthesize bifunctional fatty acids derivatives to incorporate into lipid molecules with the goal of determining lipid-protein interactions and lipid transport in cells without triggering early lipid metabolism, a technique that has future applications in therapeutic drug development.

Kate Groscup

Bates College

MENTORS Jessica Cope, Benjamin Barad, Ph.D. (PI)

Refining automated surface reconstruction for morphometrics in cryo-ET

Cellular cryo-electron tomography (cryo-ET) is a cutting-edge technique that produces high-resolution 3D reconstructions of protein and organelle structures captured within their native cellular environments through various flash freezing methods resulting in groundbreaking observations and statistical comparisons. To process cryo-ET data, our lab developed a fast and automated surface morphometrics pipeline to enable the modeling of complex membranes observed in tomograms and complete various calculations within a reasonable time while eliminating manual bias. My project focused on refining the automated surface reconstruction of the pipeline, which deals with constructing the 3D triangular mesh representing the membranes so that more accurate and smooth models can be produced for a variety of structures that are needing to be examined by the scientific community.

Paris Harrell

Reed College

MENTORS Morgan Johnson, Beth Habecker, Ph.D (PI)

Investigation of β1AR Protein Complexes in Innervated vs. Denervated Mouse Hearts

The amount of sympathetic denervation in the heart after a myocardial infarction predicts the probability of serious ventricular arrhythmias in patients. This is explained by “denervation super-sensitivity”, where loss of sympathetic nerves leads to enhanced cellular responsiveness to β adrenergic receptor (βAR) agonists and in turn causes myocyte Ca2+ overload and arrhythmias. My project investigates a possible mechanism for the enhanced signaling of β1AR by identifying the associated protein complex in denervated hearts and comparing it with the known SAP97 and PDE4D complex in innervated hearts.

Barrett Heyer

Reed College

MENTORS Ryan Hecht, Catherine Morgans, Ph.D. (PI)

Exploring interactions between TRPM1 and STRIP2 in retinal bipolar cells

TRPM1 is a cation channel that mediates the depolarizing light response of ON-bipolar cells in the retina, an essential step in vertebrate vision. Regulation of TRPM1 trafficking to the plasma membrane is poorly understood. STRIP2, a protein implicated in calcium channel trafficking, is co-expressed with TRPM1 in ON-bipolar cells. I am investigating possible interactions between TRPM1 and STRIP2 by immunofluorescence confocal microscopy and co-immunoprecipitation from transfected HEK293 cells and retina.

Maeve Lamb

Smith College

MENTORS Rory Morgan, Ph.D., Kapil Upadhyaya, Ph.D., Michael Cohen, Ph.D., (PI)

Developing a method of tagging ADP-ribose to study PARP function

PARPs are a family of proteins that catalyze a post-translational modification called ADP-ribosylation and are important in DNA repair and the innate immune response. Using nicotinamide adenine dinucleotide (NAD+) as a substrate, PARPs transfer ADP-ribose to protein targets. To understand PARP function, we need to identify the sites of ADP-ribosylation. My project is focused on developing a novel chemoenzymatic method for detecting and enriching ADPr sites in proteins.

Conner Mullally

Lewis & Clark College

MENTORS Caitlin Donahue, Ph.D., Kimberly Beatty, Ph.D. (PI)

Development of imaging tags for Correlative Light and Electron Microscopy

Versatile Interacting Peptides (VIP) Tags are small genetically encoded peptides that can be used for fluorescent or electron microscopy depending on the functional group conjugated to the VIP tag. This ability to control the functional group conjugated to the VIP tag makes them an ideal multi-scale imaging tool. This project focuses on using thiol-maleimide chemistry to connect different functional groups to our peptides and applying them for cellular imaging

TED R. LILLEY CURE PROGRAM INTERNS

The Ted R. Lilley Continuing Umbrella of Research Education (CURE) Program is a research internship program sponsored by the Knight Cancer Institute and supported by the Ted R. Lilley Family Endowment. It offers hands-on research experiences to Portland-area high school students who excel academically and come from socially or economically disadvantaged backgrounds.

Amirah Abell

David Douglas High School

MENTORS Hisham Mohammed, Ph.D.

Rapid Immunoprecipitation of Endogenous Proteins in FFPE Tissue

The aim of this project is to isolate the Estrogen Receptor (ER) protein and interacting proteins from Formalin-Fixed, Paraffin-Embedded (FFPE) samples using a technique known as Rapid Immunoprecipitation of Endogenous Proteins (RIME). Adapting RIME to work on FFPE samples is a novel approach that hasn't been done before. Optimizing these conditions expands RIME's utility and opens the possibility to assay many banked samples of interest. This project will provide valuable insights into the interactions within ER protein complexes, potentially contributing to the development of targeted breast cancer treatments.

Tenzin Dorjee

Beaverton Academy of Science and Engineering

MENTORS Kimberly Beatty, Ph.D., Caitlin Donahue, Ph.D.

Generating MiniVIPER labeling reagents through optimized expression of MiniE-DBCO

The Beatty lab at OHSU has developed new genetic tags for labeling cellular proteins named Versatile Interacting Peptide (VIP) tags. VIP tags use an alpha-helical coiled-coil to attach a probe peptide to a peptide tag. An example is the MiniVIPER tag, which consists of a genetic tag (e.g., MiniR) that forms a heterodimer with fluorophore-labeled MiniE-DBCO. The goal of my project is to make new labeling reagents from the peptide MiniE-DBCO. This will be accomplished through a variety of testing techniques, including the use of DNA stocks for purification and transformation, BL21, and BL21*, to mention a few. New technology to understand normal and disease biology would be one of the major effects this would have on research. Sorting these expressions would allow MiniE to be used as a tag in cells to identify specific protein-protein interactions associated with health.

Mai Gomez Carbajal

Liberty High School

MENTORS Joshua Moreau, Ph.D., Malia Rettig

Uncovering the Effects of Particulate Matter on Adaptive Immune Responses

With over four million deaths annually linked to air pollution, understanding how particulate matter (PM) infiltrates and disrupts our immune system is more critical than ever. This experiment aims to investigate the impact of PM2.5 particulate matter on adaptive immunity by examining the growth and function of B-cells cultured in both the presence and absence of PM2.5. Using flow cytometry, we will measure their response to determine whether PM2.5 exposure leads to reduced growth and functionality of B cells, providing insights into the cellular mechanisms affected by air pollution and its implications for human health.

Jade McDonald

Hudson Bay High School

MENTORS Steve Kurtz, Ph.D., Christopher Eide

Characterizing the mechanisms of resistance to the Menin inhibitor revumenib in AML

Acute myeloid leukemia is an aggressive hematologic malignancy that originates in the bone marrow. It begins with a genetic mutation predominantly in the DNA of a myeloid cell, which causes the cell to multiply rapidly. Many drugs have been developed to target specific components of leukemic cells, but these have not been successful because the cells develop resistance to them. By gaining an understanding on how these cells gain resistance we can help find potential biomarkers that can detect resistance early.

Natalie Montano

Centennial High School; Portland State University

MENTORS Terri Clister, Ph.D., Rajan Kulkarni, M.D., Ph.D.

Characterizing the role of MIF protein in melanoma cells using a knockout cell line

Macrophage Migration Inhibitory Factor (MIF) is known to be involved in cancer progression. A novel drug blocking MIF shows promise in treating melanoma in mouse models. We used a MIF KO cell line to explore the specific role MIF has in melanoma proliferation. We further examined the affect a novel drug that inhibits MIF signaling has on cell signaling and cell proliferation. Exploring MIF's role in melanoma cells will further help us understand a MIF drug inhibitor as a potential therapeutic.

Hue Pham

David Douglas High School; Johns Hopkins University

MENTORS Adem Yildirim, Ph.D., Michael Ian Henderson

Cellular Interactions of Ultrasound-Responsive Mesoporous Silica Nanoparticles

Low-frequency ultrasound is emerging as a potential for safer cancer theranostics. The Yildirim lab has utilized the novel nanohybrid platform - the biodegradable, ultrasound-responsive, hydrophobically modified, mesoporous silica-based nanoparticles (UR-hMSNs) to initiate cavitation activity to ablate tumor, thus amplifying tumor antigens to enhance immunotherapies and liquid biopsy. In this study, we tested the cellular uptake ability of UR-hMSNs with different surface modifications. These surface modifications are coating materials that are prominent in our previous studies. After confirming the size of the coated UR-hMSNs with Dynamic Light Scattering (DLS), we conjugated the particles and the coatings with disparate fluorescent dyes to confirm their interactions with three tumor cell lines via Fluorescence Microscopy. Finally, we investigated the coated UR-hMSNs' cavitation activity/ultrasound responsivity with Focused Ultrasound (FUS) within the target cells' environment.

Deeyanah Rahim

Camas High School; University of Washington

MENTORS Gaurav Sahay, Ph.D., Yulia Eygeris, Ph.D.

Correlating Apolipoprotein Binding to Lipid Nanoparticle with Hepatic Cell Transfection

We created four varying LNP formulations which include two types of proteins, LDLR and APOE, LDLR is a collective gene family which consists of lipoprotein receptors while APOE is the binding protein for LDLR. With these solutions, we used Uncle to test the Tm (melting point) and Tagg (aggregation point) of these particles in regards to concentration of the solution as well as temperature of the environment and identified the specific protein interactions that lead to transfection.

Grace Ramazani

David Douglas High School

MENTORS Christopher Eide, Steve Kurtz, Ph.D.

Understanding and characterizing the mechanism of resistance and sensitivity to cladribine in Acute Myeloid leukemia (AML)

Patients who are elderly or unfit for intensive chemotherapy have poor outcomes. While newly diagnosed early patients with AML initially respond to standard therapies like a combination of azacytidine and venetoclax (Aza + Ven), many eventually relapse or become resistant. For patients who develop resistance with a differentiated tumor, the drug cladribine can be effective. In this project, we will characterize the mechanisms of sensitivity and resistance to cladribine in AML, understand hematopoiesis and how it is dysregulated in leukemia, understand cladribine's mechanism of action and how resistance develops and understand cladribine clinical use in treating AML.

EQUITY RESEARCH PROGRAM INTERNS

The OHSU Equity Research Program offers an exciting opportunity for diverse undergraduate college students to spend eight weeks working on research projects alongside faculty, scientists, and graduate students. Internship tracks are: Biomedical Sciences, School of Medicine, and School of Dentistry.

Kalkidan Abey

University of Oregon

MENTORS Joshua Lupton M.D., M.P.H., M.Phil.

Investigating the association between Double Sequential External Defibrillation and outcome in patients experiencing shockable out of hospital cardiac arrest

Cardiac arrest continues to be the leading cause of death in the United States. A subset of cardiac arrests that should normally respond to shocks with a defibrillator are classified as shock-refractory, as they do not achieve spontaneous circulation after three or more defibrillation attempts. Double sequential external defibrillation (DSED), the use of two defibrillators one after the others, had been proposed as a treatment option in these cases. Using data from the Portland Cardiac Arrest Epidemiologic Registry, we investigate the use of and timing to DSED) and its association with patient outcomes.

Leen Albaka

Portland State University

MENTORS Chara Rydzak, M.D., Ph.D.

Enhancing Diagnosis and Awareness of Rare Cardiothoracic Disease and Systemic Histiocytic Disorder Through Radiology

Radiology plays an important role in the study and management of rare diseases due to its ability to provide detailed imaging of the body's internal structures through advanced imaging techniques such as MRI, CT scans, and X-rays. This project aims to raise awareness and enhance an understanding of rare cardiothoracic diseases such as Aortic Atresia and a systemic histiocytic disorder called Erdheim-Chester (ECD) that affects multiple organs and tissues in the body. By creating interactive educational modules based on radiology techniques, seeking to enhance the knowledge and diagnostic accuracy among healthcare professionals, and radiology trainees ultimately improving patient care and outcomes.

Olivia Maldonado Avila

Linfield University

MENTORS Lauren Rodda, Ph.D.

The Role of CCR10 and CCL28 in Directing Lung-Resident Plasma Cells During Influenza

Influenza is a highly contagious respiratory virus infection that remains a significant global health concern. Intramuscular vaccination has been the traditional route of immunization, as it induces a systemic immune response. However, intranasal vaccination offers an alternative route to take advantage of as it has been shown to induce an immune response in the lungs after respiratory infection. Vaccine protection against infection is based on the ability of plasma cells to make neutralizing antibodies. Plasma cells express a chemokine receptor called CCR10 that interacts with CCL28, a chemokine produced by submucosal gland (SMG) cells in the trachea and lungs. This project will investigate the role of CCL28 and CCR10 in directing plasma cell migration to the SMG during flu infection. In addition to understanding their contribution to the residency and survival of plasma cells in the lung. The findings of this study could have significant implications for the development of more effective targeted vaccines against respiratory infections in the future.

Nadia Guadalupe Calderon-Ruiz

University of Portland

MENTORS Katharine Zuckerman, M.D., M.P.H., FAAP

Enhancing Autism Care Access for Spanish-Speaking Latino Families: Developing Culturally and Linguistically Adapted Interventions for U.S. Latino Parents of Children with ASD

This study aims to develop specifications for the bilingual autism parent training intervention (Opt-in Early) by recommending adaptations to the existing program to better align with the cultural and linguistic needs of the U.S. Latino parents of children with ASD. We are conducting bilingual focus groups and gathering data to develop specifications for the Opt-in Early autism parent training intervention, ensuring it is culturally and linguistically adapted to better serve the U.S. Latino families with children with ASD.

Jing Chen

Oregon State University

MENTORS Isabella Rauch, Ph.D.

Identification of Inflammasomes Activated in Intestinal Epithelial Cells During *Citrobacter rodentium* Infection

Escherichia coli (E. coli), a gram-negative bacterium commonly found in the lower intestine of warm-blooded organisms, is mostly harmless. However, certain strains can cause serious diseases in the gastrointestinal, urinary, or central nervous system. This project investigates the intracellular defenses in intestinal epithelial cells (IECs) during Escherichia coli (E. coli) infection, with a specific focus on identifying activated inflammasomes. While NLRC4 and CASP11 inflammasomes are known to trigger pyroptosis of infected IECs, previous data showed that pyroptosis can occur in absences of these inflammasomes during E. coli infection, suggesting the involvement of other inflammasomes. Using Lentiviral/CRISPR technique, we knock out target gene sequence from primary murine IEC organoids to identify additional inflammasomes. The project provides further insights of the innate immune process in IECs, as well as characterizing the inflammasome driven expulsion process in IECs.

Jodi Chen

University of Portland

MENTORS Bingbing Li, M.D., Ph.D.

Evaluation of Omacetaxine and Methotrexate as Potential Treatments for Clear Cell Sarcoma of Soft Tissue

Clear cell sarcoma of soft tissue (CCSST) is a rare and aggressive tumor that primarily affects adolescents and young adults. Currently, there is no standard therapy for CCSST. Our preliminary studies have shown that two FDA-approved drugs, omacetaxine and methotrexate (MTX), exhibit anti-proliferative activities in CCSST cells. In this project, we are further evaluating the efficacy of these drugs as potential therapies for CCSST.

Nick Ferguson

Portland State University

MENTORS Summer Gibbs, Ph.D., Margaux Schwartz

Synthesis of Cy5 Dye with PSMA Targeting Vector (EuK)

This project aims to synthesize a PSMA-targeted contrasting agent for use in fluorescence-guided prostate cancer resection. In particular, we will be synthesizing Cy5 dye, a fluorescent molecule that emits in the near infrared. To achieve specificity for prostate cancer cells, we will link the Cy5 dye to the PSMA-targeting vector EuK. This capitalizes on the overexpression of PSMA (prostate-specific membrane antigen) in prostate cancer cells. Lastly, the targeted dye will be tested through cell studies to assess fluorophore brightness and cancer specificity.

Natalie Goering

Oregon State University

MENTORS Terry Morgan, M.D., Ph.D.

Whole Genome Bisulfite Sequencing of Mouse Pancreas to Test for Fetal Sex-Dependent Variation in DNA Methylation

The in-utero environment may lead to epigenetic changes that affect the long-term health outcomes of offspring. Fetal growth restriction (FGR) is a complex and multifactorial disorder in which the fetus grows poorly during pregnancy due to uteroplacental dysfunction in most cases, resulting in abnormally small babies with low birth weights. In our project, we performed whole genome bisulfite sequencing (WGBS) on pancreatic DNA obtained from micro-dissected whole pancreata from FGR mouse models and normal birthweight controls in the F1 and F2 generations to test for pancreas-specific epigenetic changes, such as differences in pancreatic DNA methylation, between young males and females. This work will enable us to compare the impact of adverse in utero environments on fetal epigenetic programming of pancreatic tissue between the fetal sexes.

Jack Huang

Oregon State University

MENTORS Kai Tao, Ph.D.

Antibody Bioengineering for Highly-Multiplexed Immunodetection in Cancer Research

To address the high demand for antibody multiplexing in biomedical research and clinic applications, Dr. Tao and his team have developed an efficient, sustainable, cost-effective, reproducible site-specific antibody covalent labeling strategy through bioengineered secondary nanobodies. Jack's project focuses on assisting the team in demonstrating and collecting data to showcase the superior specificity, consistency, and flexibility of this novel antibody bioengineering technology compared to traditional techniques. He will apply this secondary nanobody technology in various multiplexed immunolabeling applications, such as multiplexed cell/tissue immunofluorescence imaging, multiplexed tissue imaging, multiplex fluorescent western blotting, etc.

Jimena Caballero Ignacio

Oregon State University

MENTORS Jaime Wildman Peterson, M.D., M.P.H.

Estamos Listos: A clinic based, Spanish school readiness checklist designed by Latino families, providers and early childhood educators

In the Listos School Readiness Lab we are adapting and testing a parent designed school readiness checklist for Latino, Spanish speaking parents, their pediatrician, and local preschool and kindergarten teachers, we have designed a culturally responsive checklist to promote early math and literacy in primary care. This summer, we are pilot testing the Spanish Kinder Checklist to ensure feasibility and acceptability with Spanish speaking parents and pediatric providers at three Oregon clinics: Woodburn, Hillsboro and Bethany.

Annabel Jensen

Portland State University

MENTORS Suzanne Fei, Ph.D.

Whole brain imaging and c-fos quantification in a mouse model of risk for excessive alcohol drinking

Binge drinking is a pattern of drinking that results in intoxication and is known to increase the risk of developing an Alcohol Use Disorder (AUD). Here, we determine which brain regions are engaged in binge-like drinking using a genetic model of risk for drinking to intoxication (inbred High Drinking in the Dark line 1, iHDID-1, mice). To determine which brain regions are engaged, we measure levels of c-Fos, an immediate early gene induced by stimuli, including alcohol drinking. Prior research has found significant sex differences in the pathways involved in and the manifestation of AUD, so sex was included as a biological variable to improve the translational relevance of the results. R was used for inferential statistics, descriptive statistics, and informatics techniques such as data wrangling, visualization, and analysis. This study identified several novel brain regions engaged during excessive alcohol drinking and differences in what regions are engaged in male versus female ethanol-drinking mice. These results illuminate how binge-like drinking differentially affects the brains of males and females. This work was supported by the National Institute on Alcohol Abuse and Alcoholism (AA030908, AA030806, AA010760, AA013519, AA007468), National Institute on Drug Abuse (R25 DA050727), US Department of Veterans Affairs Merit Award I01 BX004699, and generous gift from the John R. Andrews family.

Natasha Kujovich

Oregon State University

MENTORS Monica Hinds, Ph.D.

The Effects of THC and CBD on Endothelial Glycocalyx and Viability

As cannabis use has become more prevalent, the need for cannabis-based research also increases. Cannabis contains the cannabinoids, Δ9-tetrahydrocannabinol (THC) and cannabidiol (CBD), that attach to cannabinoid receptors (CB_1 and CB_2) on endothelial cells. We are testing how THC and CBD treatments affect the endothelial glycocalyx and endothelial cell viability of human aortic endothelial cells. This research will help us identify how cannabis may affect endothelial inflammation and endothelial dysfunction, which can lead to cardiovascular disease.

Fabiana Lopez-Ruiz

Willamette University

MENTORS Stuart Ibsen, Ph.D.

The Use of Dielectrophoresis to Analyze Cancer-Derived Nanoparticles in Biological Fluid Samples

This project aims to enhance early cancer detection by using dielectrophoresis technology to isolate and analyze cancer-derived nanoparticles in biological fluids. By characterizing the types of nanoparticles' present in circulation, we hope to enhance early detection methods in solid tumor malignancies, particularly for pancreatic ductal adenocarcinoma (PDAC). The findings will contribute to the development of a comprehensive cancer detection biomarker panel, improving early diagnosis and patient outcomes for individuals with PDAC.

Ximena Nava-Diaz

Oregon State University

MENTORS Craig Newgard, M.D., M.P.H.

Neighborhood Characteristics Associated with Firearm Injuries in Children and Adolescents Across the U.S.

Our research investigates the association between neighborhood characteristics and pediatric firearm injuries across the United States. Using an ecological study design, we analyzed data from 47 states between 2018 and 2022, examining 65 variables at the ZIP Code level from multiple sources, including demographic, socioeconomic, and structural measures. Our findings indicate that factors such as structural racism, social vulnerability, and gun legislation account for a significant portion of the variability in pediatric firearm incidents, highlighting the importance of these elements in public health planning and community interventions.

Debbie Okeke

University of Oregon

MENTORS Kathy Grant, Ph.D.

Using Magnetic Resonance Imaging to Understand the Neural Basis of Behavioral Flexibility: A Volumetric Analysis in Rhesus Macaques

Behavioral flexibility is the ability to adapt to the changing rules of one's environment. Deficits in this skill have been linked to various neurocognitive or behavioral disorders such as autism, obsessive compulsive disorder, and addiction. Previous research has focused on developing a multifactor performance index (PI) within the attentional set shifting task (ASST) to measure individual differences in behavioral flexibility among non-human primates (NHP) and found PI reliably predicts future drinking habits within macaques. The goal of this project was to explore the neuroanatomical basis of PI using magnetic resonance imaging (MRI) data of rhesus macaques to determine if a relationship exists between the volume of specific regions of interest and PI. Increased understanding of the neural foundations of behavioral flexibility may point to potential targets for further study or treatment.

Celine Lopez Padilla

University of Oregon

MENTORS Jonathan Pruneda, Ph.D., Phil Yates Ph.D.

Novel Inhibitors in Leishmania mexicana: A Pathway to New Antileishmanial Therapies

Leishmania mexicana, a parasite responsible for leishmaniasis in tropical regions, undergoes a complex lifecycle involving transmission by sandflies and replication within mammalian macrophages, resulting in debilitating skin lesions. Current treatments are inadequate due to their toxicity and inefficacy. Recent studies have identified promising compounds such as arylquin VMS-7-25 and chloronitrobenzamide compound 254. These compounds are hypothesized to target a crucial parasite enzyme, dephospho-coenzyme A kinase (DPCK), essential for Coenzyme A biosynthesis. This project aims to investigate whether these compounds stabilize the protein against thermal denaturation and inhibit its activity using recombinant protein expression in E. coli vectors, potentially paving the way for new therapeutic approaches to combat leishmaniasis.

Claire Sherman

Lewis & Clark College

MENTORS Daniel Zuckerman, Ph.D.

Investigating the Structural Fluctuations of an IDP via Molecular Dynamics Simulations

Molecular dynamics (M.D.) is an advanced computational technique that allows us to study biological systems and interactions at an atomic level. Intrinsically disordered proteins (IDPs) lack stable secondary and tertiary structures under physiological conditions, they are inherently flexibly and can conform to different binding sites. Their flexibility explains why they are suitable binding partners. The focus of my project is to use M.D. simulations to analyze the behavior of the Intermediate Chain (IC) IDP, independent of an LC8 bound complex. The LC8 protein is a versatile protein hub that links cargo proteins to the dynein motor. This project's main aim is to aid understanding of the binding equilibrium between LC8 and the IC protein, but this cannot be achieved without understanding how IC behaves individually

Gabriella Tangkilisan

Portland State University

MENTORS Jeremy Copperman, Ph.D., Vaibhav Murthy

Modeling Early Breast Cancer Metastasis Dynamics in the Lung: Quantifying Single-Cell Signaling and Microenvironmental Interactions

Triple negative breast cancer (TNBC) is a subtype of breast cancer which can metastasize to the lung. While the invading cells have multiple pro-survival growth factors in the lung microenvironment, knowledge on the cancer cell response to these factors upon initial invasion to the lung is limited. The goal of our project is to capture information about the different cell signaling patterns in the microenvironment and how it determines cell fate (survival or death). We will track Extracellular Signal-regulated Kinase (ERK) activity (a downstream effector of Epidermal Growth Factor Receptor, a common driver of TNBC) by creating a computational model capable of nuclear segmentation in 3D live-cell imaging of bioengineered 3D tissues. The model will be used to quantify cell cytoplasm-to-nuclei ratios of a fluorescent ERK translocation reporter. The cytoplasmic nuclear ratio quantification will then provide insight to the influence of ERK signaling on cell fate during the early stages of metastasis to the lung.

Annie Tran

Indiana University

MENTORS Hui Wu, Ph.D.

Investigating diadenylate cyclase's role in biofilm formation and environmental stress in Streptococcus mutans

Streptococcus mutans is the most common bacteria in the mouth, and it contributes to dental caries. We aim to identify the characteristics of the DAC mutant strain to determine its ability to tolerate environmental stress such as detergent. By studying this, we hope to understand the gene function in S. mutans and its impact on pathogenicity.

Hao Tran

Swarthmore College

MENTORS Katharine Zuckerman, M.D., M.P.H, FAAP

Constructing culturally appropriate surveys to better understand how Limited English Proficiency (LEP) affects families' access to autism care for their children

The Zuckerman lab's LEAP project is centered around understanding how families with limited English proficiency (LEP) get access to autism diagnosis and care for their children. Using relevant measures, we constructed surveys in 5 distinct languages including English, Spanish, Chinese-Mandarin, Kreyòl, and Vietnamese. To ensure accurate translations, appropriateness, and reading level of each question, we will be conducting cognitive interviews with native speakers who have kids with ASD. We are hoping to gain valuable and meaningful insights from parents to improve the LEAP survey and better understand how these families access autism care for their children.

Lisa Truong

University of Southern California

MENTORS Omar Kamal, M.D.

Assessing the correlation between MRI proton density fat fraction (MR-PDFF) and CT attenuation in Pancreatic fat quantification

The buildup of fat within the pancreas, known as pancreatic steatosis, can impair the function of beta cells (B cells) responsible for producing insulin. While MRI Proton Density Fat Fraction (PDFF) provides a reliable non-invasive method for quantifying pancreatic triglyceride content, it is not widely adopted in clinical practice due to technical requirements and time limitations. In contrast, abdominal CT scans, which always include the pancreas, are more commonly performed and more widely available, although their accuracy in fat quantification is not well established. The aim of this study is to assess the correlation between MR-PDFF and CT attenuation of the pancreas.

Claire Tuquero

Simmons University

MENTORS Henry Lin, M.D., M.B.A

Improving Access to Pediatric Gastroenterology Care in Rural Oregon: An Assessment of the Pediatric GI Referral Needs, Challenges, and Expectations of Rural Primary Care Providers

Access to pediatric gastroenterology (GI) care in rural communities is limited and primary care providers (PCPs) in these areas rely on the referral process in order for pediatric patients to obtain appropriate specialist management of their GI condition. By conducting semi-structured interviews with various pediatric GI referring providers throughout Oregon, we can obtain valuable feedback on ways to improve our current referral process to ensure health equity and increase accessibility of pediatric subspecialty care for rural Oregon.

Tomas Veliz

Lewis & Clark College

MENTORS Carolyn Schutt Ibsen, Ph.D.

Investigating the Role of Vascular Endothelial Cells in the Link between Cardiovascular Disease and Breast Cancer Progression

Cardiovascular disease (CVD) has been associated with increased risk of cancer progression and it is thought that circulating factors released from CVD may be involved in the process. However, the role of endothelial cells (ECs) in this process remains poorly understood. In this project, we characterized how specific proteins secreted in CVD patients affect cytokine release from ECs using reverse transcription quantitative polymerase chain reaction. In addition, our project also contributed to the development of a bio-fabricated 3D vascular model that better replicates the environment where ECs naturally reside. This study aims to contribute valuable insights into the field of reverse cardio-oncology which can inform improved cancer screening standards for patients with a CVD diagnosis.

SCHOOL OF DENTISTRY RESEARCH INTERNSHIP

The OHSU School of Dentistry Research Internship Program provides interns with practical research experience in the fields of dental and oral health. This program is designed to support high school students, undergraduates, and those matriculating into the OHSU Dentistry program, offering them valuable opportunities to engage in research activities. Our goal is to establish clear pathways to careers in dental, oral, and craniofacial research, fostering the next generation of researchers in these critical areas.

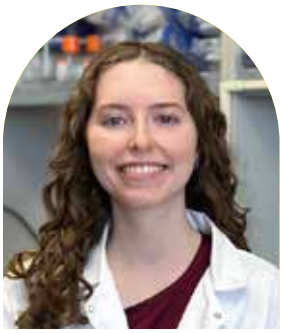
Deetya Brahmarouthu

Oregon State University

MENTORS David Anderson, Ph.D., Justin Merritt, Ph.D.

Production of Recombinant Human Histone Fusions for Surface Display Platform

Microbial nucleomodulins are effector proteins that epigenetically alter a target host cell's gene expression pattern. By studying this class of proteins found within the microbiome, we can better understand the dialog between humans and their microbial communities. Our efforts to build a system capable of discovering these molecules began with recombinant production of HaloTag-histone fusions to be used as baits for a surface display assay. Heterodimeric fusions of HaloTag-histone2A-histone2B and HaloTag-histone3-histone4 were expressed using E. coli. Proteins were rescued from the insoluble fraction using a denaturing and refolding protocol with functional HaloTag activity confirmed by the binding of its cognate fluorescent TMR-HaloLigand. Studies are ongoing to examine the functionality and oligomeric status of the histones in this configuration.



Katie Crofton

Rollins College

MENTORS Jonathon Baker, Ph.D.

Fatty Acid Metabolism Impacts Acid and Oxidative Stress Tolerance in *Pathogenic Streptococcus*

Streptococcus is a genus of bacteria that contains many significant human pathogens. Some of these are *Streptococcus mutans*, which causes caries on teeth, *Streptococcus pyogenes*, responsible for strep throat, and *Streptococcus pneumoniae*, which leads to pneumonia. *Streptococcus* species are known to increase the proportion of unsaturated fatty acids in their membrane in response to environmental stress. This shift is crucial for stress tolerance and virulence in *S. mutans*. It is understood that by targeting the source of unsaturated fatty acids, *S. mutans* will become less virulent. Our lab is currently examining whether this shift is also required to survive stressful environments and increase virulence in *S. pyogenes* and *S. pneumoniae*.

Anli Davis

Lewis & Clark College

MENTORS Jens Kreth, Ph.D., Emily Helliwell, Ph.D., MSc, Camilla de Mattos, Ph.D., Molly Burnside

Influence of Corynebacterial Bacteria on Candida albicans and Streptococcus mutans Interactions

Candida albicans is a human-associated fungus that can grow in yeast form or develop long filaments called hyphae. *C. albicans* is a normal resident of the oral microbiome but can also cause more severe infections such as oral thrush. It grows particularly well with *Streptococcus mutans (S. mutans)* and has been identified as a primary etiological factor of severe early childhood caries (s-ECC). *Corynebacterium durum (C. durum)* and its extracellular membrane vesicles (EMVs) have been shown to inhibit hyphae growth. In these experiments, we explored how *C. durum* affects hyphae formation.

Alicia Jin

Brown University

MENTORS Lyndie Foster Page Ph.D., B.D.S., Dave Chandra D.M.D., Ph.D.

Incidence of oral and oropharyngeal cancer in Oregon (2000 – 2021) – recent trends and regional variation.

Squamous cell carcinoma (SCC) is the most common malignancy in the oral cavity and in the oropharynx. In Oregon, reported incidence of SCC of the oral cavity and the oropharynx is pooled – this is less than ideal given the difference in their etiology and at risk groups. To better understand the epidemiology, we will identify which Oregon counties have greater rates of oral cavity SCC and oropharyngeal SCC. A better understanding of the epidemiology of these two types will allow for more targeted approaches to prevention.

Samantha Williams

Spelman College

MENTORS Jonathon Baker, Ph.D. (PI)

Exploring the Impact of Unsaturated Fatty Acids on Streptococcus Interspecies Interactions

Streptococcus is an abundant genus containing many commensal and pathogenic species that affect the oral cavity. For example, *S. mutans* contributes significantly to the development of dental caries, *S. pyogenes* is a major cause of pharyngitis, and *S. pneumoniae* is a major cause of pneumonia. Other *Streptococcus* species, such as *S. gordonii, S. mitis, S. sanguinis, and S. salivarius,* are largely commensal species that may inhibit the growth of the pathogenic species. *Streptococcus spp.* can increase the concentrations of fatty acids in their membranes to protect their cells from environmental stresses. This study investigated how loss of the ability to produce unsaturated fatty acids impacted the interaction between commensal and pathogenic *Streptococcus* species.

STEMPREP PROGRAM INTERNS

The STEMPrep Program at OHSU is part of the larger national STEMPrep Project coordinated by the Distance Learning Center. Our collective mission is to provide longitudinal STEM experiences to talented trainees from under-represented populations in STEM across their learning continuum.

Anela Awai-Stewart

Kamehameha Schools Maui

MENTORS Kyle Gribbin (Direct Mentor), Katelyn Byrne, Ph.D. (PI)

Examining tumor cell expressed MHC in T cell response to PDAC

Recent studies show reduced expression and function of MHC-I on tumors correlates with immune evasion and suppression, along with immunotherapy resistance. The discovery of MHC-II expression on subsets of tumor cells is relatively new and less studied, especially in the context of pancreatic cancer. Studies have linked this expression with increased T cell infiltration, response to immunotherapy, and patient survival. This project aims to interrogate the relationship between tumor cell-expressed MHC expression and T cell response in PDAC to increase efficacy of immunotherapy.

Māhealani Briones

Kamehameha Schools Kapālama

MENTORS Ankit Pandeya, Ph.D. (Direct Mentor), Isabella Rauch, Ph.D. (PI)

Exploring differences in inflammasome gene expression between neonates and adults

Inflammasomes are multiprotein complexes that detect pathogens and other damage associated molecules, triggering pyroptosis. One of the inflammasomes, the NAIP/NLRC4 inflammasome has shown to be nonfunctional in adult human epithelial cells. However, several gain-of-function mutations in the NLRC4 gene lead to severe enterocolitis. However, these syndromes fade slowly in adulthood, which may suggest that these inflammasomes may be more functional in neonates than adults. In this project, we will be comparing the expressions of various inflammasome genes between neonates and adults in intestinal epithelial cells. We will be using RNA from primary intestinal epithelial cells from neonate and adult murine models and small intestinal organoids from neonate and adult human and murine models to test the expression of various inflammasome genes. The findings will help to illustrate the differences in inflammatory diseases between neonates and adults.

Maya Griffith

University of Miami

MENTORS Samuel Newton (Direct Mentor), Teresa Zimmers, Ph.D. (PI)

Examining the role of GLP-1R antagonism in a murine model of pancreatic cancer

Cancer cachexia, a significant loss of muscle and fat mass, is one of the leading causes of death in patients with pancreatic cancer. Glucagon-like peptide –1 Receptor, located mainly in the pancreas and hypothalamus, is known to regulate food intake and reduce inflammation. he objective of this project is to treat mice with a GLP-1R antagonist to decrease tumor size, reduce cachectic effects, and increase the immune response to the tumor.

Sydney Harris

Brown University

MENTORS David Constant, Ph.D. (Direct Mentor), Tim Nice, Ph.D. (PI)

Investigating IRF6 protein interactions driving intestinal epithelial cell identity

Understanding the role of transcription factors that control the function of intestinal epithelial cells is essential for studying intestinal disease. Interferon regulatory factor 6 (Irf6) is known for its role in the differentiation of skin epithelial cells, but its role in the intestinal epithelium remains understudied. The Nice Lab has identified IRF6 as a key transcription factor in the intestine but has yet to establish its molecular mechanisms. My project seeks to establish the protocols and reagents necessary to investigate Irf6 phosphorylation and heterodimerization in differentiated epithelial organoid cultures.

Ravneet Kaur

Strath Haven High School

MENTORS Chelsea Jenkins, Ph.D. (Direct Mentor), Robert Eil, M.D. (PI)

Editing of T-cell ion channel genes affects tumor response

Ion channels allow for T-cell activation and mediate cellular response with their ability to let specific ions pass through the plasma membrane. This experiment involves optimizing PCR conditions to detect CRISPR/Cas9 gene editing in T-cells.

Olayinka Lamikanra

Colby College

MENTORS Jennifer Finan (Direct Mentor), Jonathan Brody, Ph.D. (PI)

Deciphering the role of HuR in pancreatic cancer extracellular vesicles (EV) signaling to endothelial cell

This summer I've been studying the intercellular communication between PDAC cells and endothelial cells. My goal is to assess how PDAC cellintrinsic HuR impacts endothelial cell function via EV signaling through in vitro phenotypic assays. I've quantified endothelial cell migration, barrier function, and EV import when treated with HuR WT vs. KO PDAC EVs.

Shriya Myneni

Oregon Episcopal School

MENTORS Miffy Guo, (Direct Mentor), Jonathan Brody, Ph.D. (PI)

Understanding the tumor's intrinsic HuR's role in regulating T cell localization and response to immune stimulus

Pancreatic Ductal Adenocarcinoma (PDAC) tumors have considerably more HuR expression and activation than healthy pancreatic cells. Preliminary data shows a negative correlation between tumor HuR expression and T cell infiltration. Thus, this project aims to investigate the spatial information of T cells between wild-type tumors and HuR knock-out tumors using immunofluorescence staining. This project also studies how the cytokines IFN-γ and cGAMP may stimulate HuR expression in PDAC tumors.

Kristen Remidez

University of North Texas

MENTORS Paige Arneson-Wissink, Ph.D. (Direct Mentor), Aaron Grossberg, M.D., Ph.D. (PI)

The effects of pancreatic ductal adenocarcinoma and chemotherapy on mitochondrial metabolism

Cachexia is very prominent in patients with pancreatic ductal adenocarcinoma (PDAC) and is driven in part by disrupted energy metabolism. The effects of chemotherapy on liver metabolism require further investigation. We will investigate mitochondrial dysfunction by measuring the expression of mitophagy and lipid metabolism genes in AML12 hepatocytes treated with chemotherapy.

Cariam E. Rodríguez Santiago

Colby College

MENTORS Molly Aloia (Direct Mentor), Sarah Andres, Ph.D. (PI)

Examining the role of RNA Binding Protein Imp1 in intestinal mucus composition during neonatal intestinal inflammation in a mouse model of necrotizing enterocolitis (NEC)

This project uses a mouse model of NEC to examine the impact of the RNA binding protein Imp1 expression on intestinal mucus glycosylation during NEC pathogenesis. We tested the hypothesis that Imp1 promotes more complex mucus glycosylation during NEC. Immunofluorescent staining was used to examine intestinal mucus glycosylation patterns in intestinal tissue isolated from mice (wildtype, Imp1 intestinal epithelial knockout, and Imp1 intestinal epithelial overexpression.

THE VOLLUM/NGP UNDERGRADUATE SUMMER RESEARCH PROGRAM INTERNS

The Vollum/NGP Summer Undergraduate Program provides fellowships for undergraduate students to engage in neuroscience research at OHSU. Students are partnered with labs where they conduct basic research, learn the principles of modern neuroscience, and receive career counseling.

Neevan Abedin

Oregon State University

MENTORS Bahareh Ajami, Ph.D., Aude Chiot, Ph.D., Ellen Bouchard, Dillon Brownell

Decoding the role of microglia in motor neuron selective vulnerability in Amyotrophic Lateral Sclerosis (ALS)

Amyotrophic Lateral Sclerosis (ALS) is a fatal neurodegenerative disease affecting over 300,000 people worldwide with no known cure. Motor neurons are the primary cells affected by ALS, yet oculomotor neurons remain inexplicably resistant to neurodegeneration until the end-stage of the disease. Based on this fact, we hypothesize that microglia have a role in the selective vulnerability of motor neurons in ALS, and that microglial subsets with distinct molecular signatures will be identified differentially located near vulnerable and resistant motor neurons. This can lead to defining a class of microglial cell that can be used to develop a potential therapeutic target for ALS treatment.

Lana Ibrahem

University of California, Santa Barbara

MENTORS Kevin Wright, Ph.D., Jennifer Jahncke, Ph.D., Teva Bracha

The role of glycosylated Dystroglycan in the development of the murine retina

Dystroglycan is a Dystrophin-associated glycoprotein integral to the development of structural integrity and vasculature in the mammalian retina. Our research seeks to understand the importance of glycosylation in Dystroglycan's function by conditionally deleting the glycosyltransferase Pomt2 from retinal progenitors using a $Six3^{Cre}$ mouse line. Pomt2 is responsible for the initial steps in the glycosylation of Dystroglycan and $Six3^{Cre}$; $Pomt2^{cKOs}$ therefore express unglycosylated Dystroglycan, allowing us to effectively determine the role of glycosylation in Dystroglycan's ability to facilitate retinal development. The downstream applications of our model are to ultimately facilitate a deeper understanding of Dystroglycan and its structural components in retinal progenitor cells to further the understanding of its contribution to retinal phenotypes commonly observed in Dystroglycan-linked muscular dystrophies.

Medha Mageswaran

Nova Southeastern University

MENTORS Alex Kawa, Ph.D., Marina Wolf, Ph.D.

The Role of Nucleus Accumbens Cholinergic Interneurons in Incubation of Cocaine Craving

After prolonged withdrawal from cocaine self-administration, rats exhibit more intense cue-induced cocaine seeking on Day 40 of abstinence compared to Day 1. This behavioral change during the incubation of cocaine craving is accompanied by alterations in the nucleus accumbens (NAc). Cholinergic interneurons, a sparse neuronal population within the NAc, play a critical role in cocaine-induced motivation. We are utilizing RNAscope in situ hybridization to identify changes in mRNA expression of these interneurons during cocaine self-administration and the subsequent abstinence period.

Amber Prasad

Cornell University

MENTORS Nora Gray, Ph.D., Sam Varada

Mitochondrial Stress and NRF2 Expression Correlation with Clinical Outcomes in Parkinson's Disease Patients

Increased mitochondrial dysfunction and oxidative stress are early events in Parkinson's Disease (PD) and widespread in the PD brain, contributing to neuronal degradation and cell loss. Antioxidant response is typically regulated by the protein NRF2, but its levels are lower in the PD brain, resulting in the creation of more reactive oxygen species, which then causes further mitochondrial damage. These changes in mitochondrial function and antioxidant response are also seen in peripheral blood mononuclear cells. How do these blood biomarkers correlate with clinical outcomes in PD patients? Is there association with disease severity, which may be useful in early diagnosis or intervention?

Georgia Sims

Tulane University

MENTORS Stephen David, Ph.D.

Investigating harmonic template neurons in the primary auditory cortex of ferrets

Harmonicity, found in music, speech, animal vocalizations, and nature, is a key structure of sound. The neural mechanisms by which the brain extracts harmonic structures from complex sounds are not well understood. This study aims to identify harmonic template neurons in the primary auditory cortex of ferrets, which selectively respond to harmonic complex tones over pure or inharmonic tones.

Hannah Webber

Christopher Newport University

MENTORS John Williams, Ph.D.

Evaluating the functionality of a photoswitchable THC compound in ex vivo brain slices

We are evaluating the functionality of a new photoswitchable THC compound in brain slice recordings in the rat substantia nigra pars compacta (SNc). THC is known to act on presynaptic CB1 receptors on inputs to the SNc resulting reduced GABAb release onto dopamine neurons. Due to THC being slow acting and highly lipophilic, a photoswitchable THC compound could be beneficial in future research owing to better spatial and temporal control. We will test the functionality through electrophysiology by looking at inhibition of GABAb inhibitory postsynaptic currents of the new compound in comparison to full agonists (CP55940, WIN,212-2) and THC.

Kamlyn Yosick

Mount Holyoke College

MENTORS James Frank, Ph.D.

The optimization of a CB1 cAMP assay for use with allosteric modulators

Negative and positive allosteric modulators (NAMs and PAMs) of CB1 receptors have therapeutic potential in the treatment of substance use disorders. In order to identify novel CB1 modulators, an assay that can monitor real-time changes in CB1 signaling is necessary. This project seeks to adapt and optimize a live-cell imaging assay for use with various CB1 allosteric modulators to measure the effects of these NAMs and PAMs on CB1-mediated cAMP levels. This assay will be used to develop novel therapeutics for use in the treatment of substance use disorders.

Catatrina Zabot-Pasini

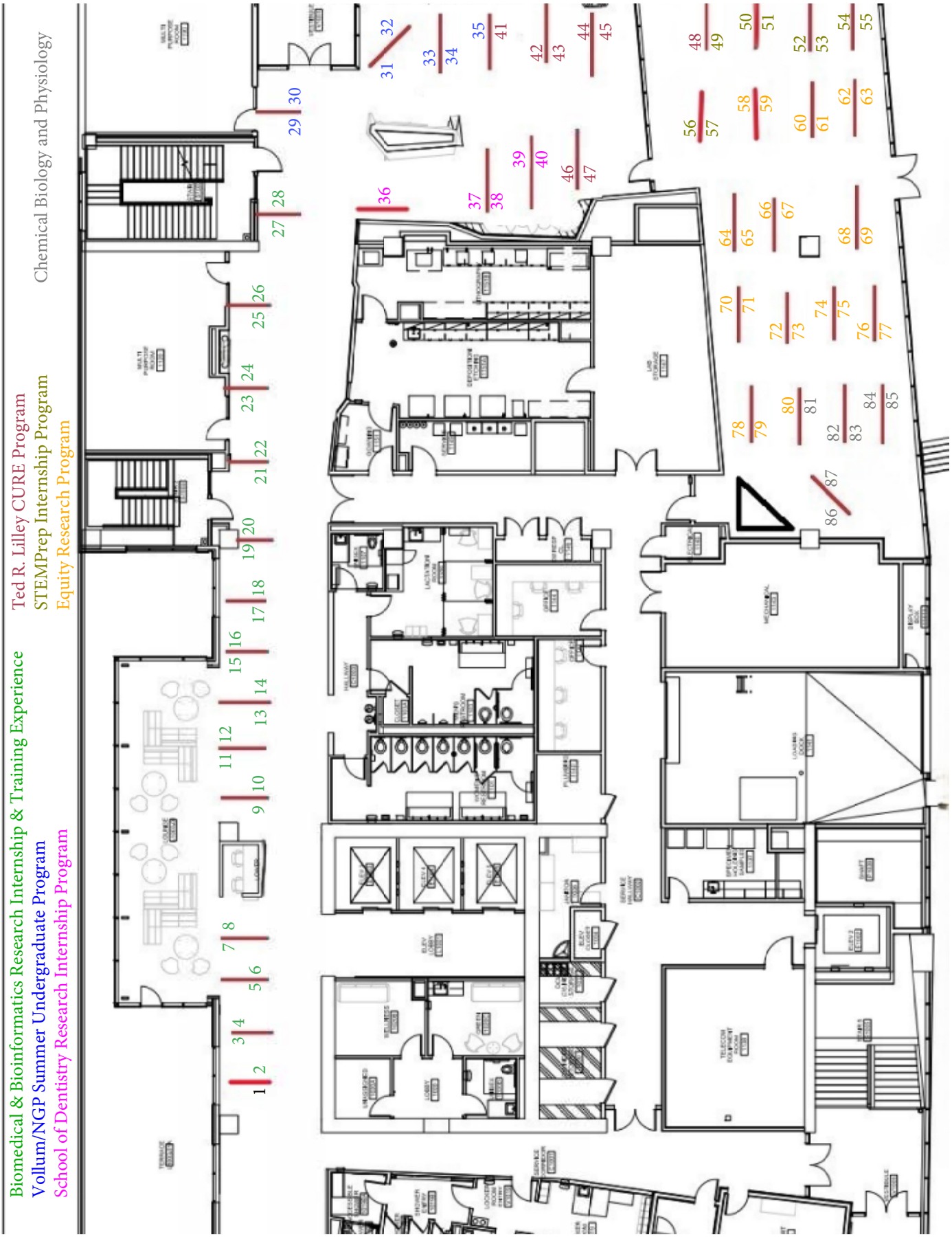
DePauw University

MENTORS Skyler Jackman, Ph.D., Chloe Le Moing, Hannah Collins

Motor Coordination in Fbxw7 KO Mice with Hypermyelinated Cerebella

Mice which have the Fbxw7 gene knocked-out in adulthood have shown an increased performance of the transcription factor Myrf, and consequently an increase in myelination of several areas of their brains. This project seeks to test the walking coordination of Fbxw7 KO mice with a hypermyelinated cerebellum phenotype, and to develop an efficient assay that can be used more broadly to test motor behavior in mice.

Floor Plan


Biomedical & Bioinformatics Research Internship & Training Experience
Vollum/NGP Summer Undergraduate Program
School of Dentistry Research Internship Program
Ted R. Lilley CURE Program
STEMPrep Internship Program
Equity Research Program
Chemical Biology and Physiology

Location Assignments

1. Informational
2. Steve Cherry
3. Janna Block-Swanson
4. Fedor Mikhailovich Chayka
5. Aubrey Welburn
6. Annika Deazley
7. Cydney Hunt
8. Madelyn Krebs
9. Alex Lapadat
10. Ethan Lu
11. Liliana McClain
12. Kaeli Miller
13. Pranav Mishra
14. Caleb Moon
15. Luisa Morgan
16. Faithlyn Moss
17. Zobe Murray
18. Ashvin Nair
19. Nmesoma E. Onyejekwe
20. Johnathan Pang
21. Koharu Sakiyama
22. Anagha Shenoy
23. Haddi Sise
24. Joey Tan
25. Phyo Theingi
26. Kim Tu
27. Natnael Yaregal
28. Saiman Adhikari
29. Neevan Abedin
30. Medha Mageswaran
31. Amber Prasad
32. Georgia Sims
33. Hannah Webber
34. Kamlyn Yosick
35. Catatrina Zabot-Pasini
36. Deetya Brahmarouthu
37. Kaitlin Crofton
38. Anli Davis
39. Alicia Jin
40. Samantha Williams
41. Amirah Abell
42. Tenzin Dorjee
43. Mai Gomez Carbajal
44. Jade McDonald
45. Natalie Montano
46. Deeyanah Rahim
47. Grace Ramazani
48. Hue Pham
49. Anela Awai-Stewart
50. Māhealani Briones
51. Maya Griffith
52. Sydney Harris
53. Ravneet Kaur
54. Olayinka Lamikanra
55. Shriya Myneni
56. Kristen Remidez
57. Cariam E. Rodríguez Santiago
58. Kalkidan Abey
59. Leen Albaka
60. Olivia Maldonado Avila
61. Nadia Guadalupe Calderon-Ruiz
62. Jing Chen
63. Jodi Chen
64. Nick Ferguson
65. Natalie Goering
66. Jack Huang
67. Jimena Caballero Ignacio
68. Annabel Jensen
69. Natasha Kujovich
70. Fabiana Lopez-Ruiz
71. Ximena Nava-Diaz
72. Debbie Okeke
73. Celine Lopez Padilla
74. Claire Sherman
75. Gabriella Tangkilisan
76. Annie Tran
77. Hao Tran
78. Lisa Truong
79. Claire Tuquero
80. Tomas Veliz
81. Sydney Blurton
82. Lilly Granados
83. Kate Groscup
84. Paris Harrell
85. Barrett Heyer
86. Maeve Lamb
87. Conner Mullally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