2025

Research Internship Poster Symposium and Ceremony

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

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August 15, 2025

1 - 3:30 p.m

Knight Cancer Research Building Auditorium

OHSU

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Program Schedule

1 P.M. | AUDITORIUM

WELCOME

Andrew Justicia
Program Manager Diversity Recruitment and Retention

Derrik Zebrowski
Knight Cancer Institute Mobile Outreach Coordinator

KEYNOTE SPEAKER

Marcus Langford, Ed.D.
Associate Vice Provost, Center for Learner Diversity and Inclusion

ACKNOWLEDGEMENT OF INTERNS AND MENTORS

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

1:30 P.M. | ATRIUM AND HALLWAY

POSTER SYMPOSIUM

3:15 P.M. | AUDITORIUM

AWARDS PRESENTATION

Internship Program Coordinators

CLOSING REMARKS

Jessica Chavez Chairez
Equity Research Program

Jade McDonald
Ted R. Lilley CURE Program

Alexander Lim
Chemical Physiology and Biochemistry Summer Undergraduate Research Program

CENTER FOR LEARNER DIVERSITY AND INCLUSION

2025 Research Internship Poster Symposium and Ceremony

Friday August 15, 2025
1 - 3:30 p.m.

OHSU Knight Cancer Research Building Auditorium 2720 S. Moody Avenue Portland, Oregon 97201

Schedule

- 1 p.m. - Recognition Ceremony
- 1:30 p.m. - Poster Symposium
- 3:15 p.m. - Poster Awards

Keynote Speaker

Marcus Langford, Ed.D

Associate Vice Provost
Center for Learner Diversity and Inclusion

Marcus Langford serves as Associate Vice Provost for the Center for Learner and Diversity Inclusion (CLDI) at Oregon Health & Science University. In this role, Marcus is responsible for providing leadership and vision for CLDI to advance OHSU's student focused efforts to foster a welcoming, respectful, and inclusive environment that that values diverse identities and experiences and enhances a sense of belonging.

On Friday, August 15, college and high school students will present their summer research projects to the OHSU community. Come view their projects and celebrate their achievements in the Knight Cancer Research Building.

Scan to view the live stream Keynote address.

If you have a disability and need an accommodation to attend or participate in this event please send a message to studentdiversity@ohsu.edu at least five business days prior to the event.

OHSU

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3. Charles Black
4. Charles Bruder
5. Prongbaramee Colling
6. Cassandra Copp
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8. Grace Huffman
9. Daquan Johnson
10. Suin (Amy) Jung
11. Carter Kroenke
12. Kyra Kuelgen
13. Cooper Lahti
14. Lucas (Luca) Lippert
15. Janani Maheswaran
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17. Jolie Nguyen
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19. Mira Rajagopalan
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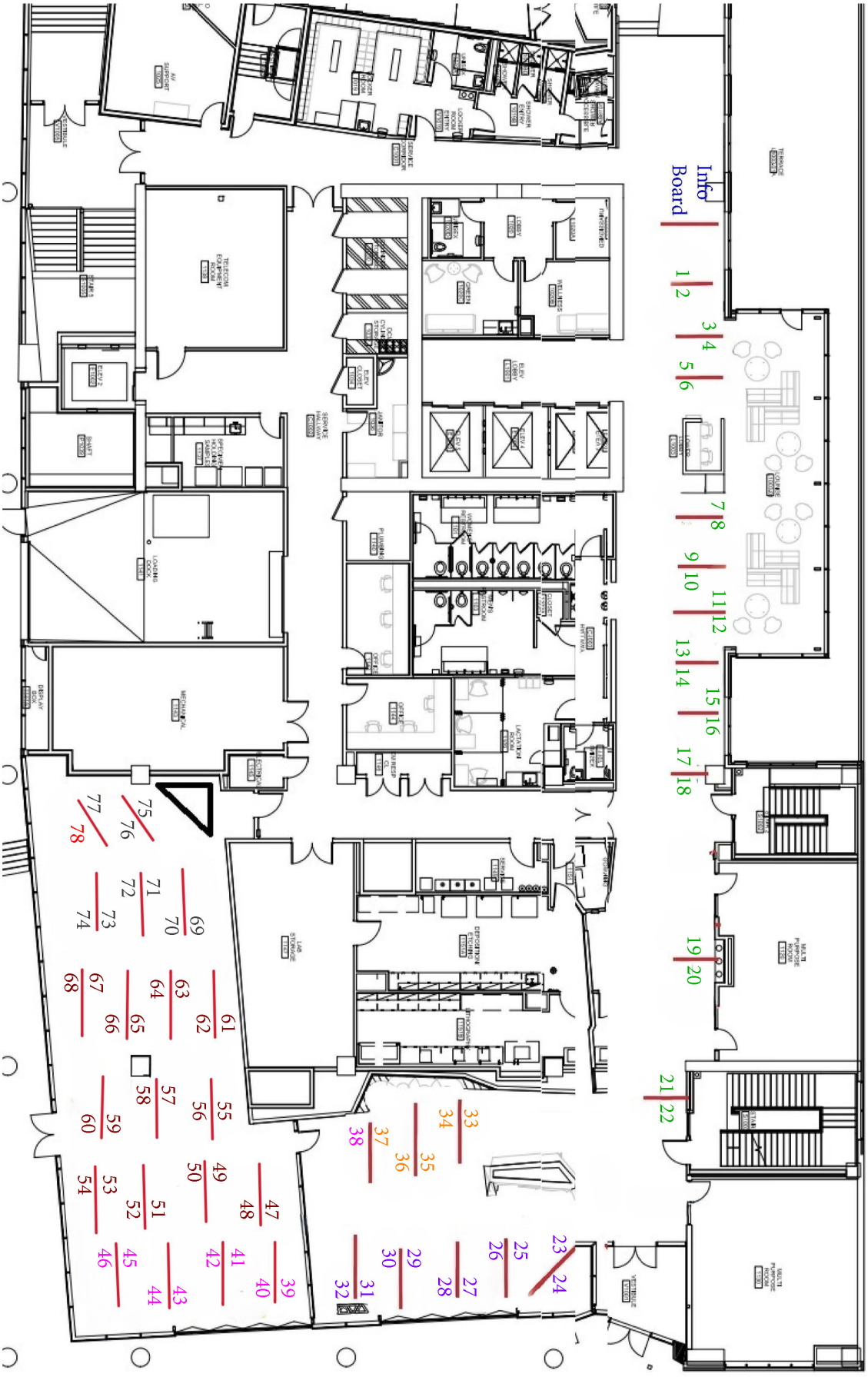
Floor Plan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BIOMEDICAL & BIOINFORMATICS RESEARCH INTERNSHIP AND TRAINING EXPERIENCE

The Biomedical & Bioinformatics Research Internship and Training Experience (B-BRITE) at the Knight Cancer Institute offers undergraduate interns a chance to immerse themselves in an 8-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.

Sara Abbott
Utah State University

MENTORS Amy Moran, Julien Carson-Wallace, Tatiana Kungurova

Development and optimization of in-house negative selection T cell isolation kits for immune response studies.

In this project, we developed in-house alternatives to commercially sold negative selection mouse T cell isolation kits, including total T cell, CD4, and CD8 isolation cocktails. Commercial kits provide a kit-specific antibody cocktail that tags unwanted cells, leaving desired cells untouched. The focus in this project was to develop homebrew versions of these antibody cocktails for total T cell, CD4 T cell, and CD8 T cell isolations that provide comparable purity and cell counts to the commercially sold versions. Making the isolation cocktails in-house can save money and resources, especially in labs that study immune responses in cancer treatments.

Angel Alvarado
Universidad de Puerto Rico, Recinto de Mayagez

MENTORS Laura Heiser, Ph.D., and Daniel Derrick

Analyzing Stromal Content influence on Pleiotrophin Signaling in Mouse Models of Triple-Negative Breast Cancer.

This study focuses on understanding how variations in tumor stromal content affect pleiotrophin (PTN) signaling in triple-negative breast cancer. Using two mouse datasets with distinct stromal profiles, we will analyze how differences in the tumor microenvironment influence PTN-related signaling pathways. Our approach includes examining ligand-receptor interactions and profiling the expression of PTN target genes within the stromal compartment. By comparing these datasets, we aim to uncover stromal-specific regulatory mechanisms that may drive tumor behavior. Ultimately, this work seeks to provide insights that can support the development of novel, stroma-targeted therapeutic strategies for TNBC.

Charles Black
Massachusetts Institute of Technology

MENTORS Xubo Song, Ph.D., Dimitry Tihomirov, MSc

Abnormal White Blood Cell Early Detection and Classification for Cancer Diagnosis and Treatment

This project focused on the implementation of computer vision models for use in classification of white blood cells (leukocytes) and its application to early detection and treatment of leukemia and other blood disorders. I investigated the use of various image segmentation techniques and advanced models such as the Dinov2 vision transformer model coupled with neural network classification to gain accuracy and speed in leukocyte novel subtyping. The aim was to improve upon and create classification models capable of not only distinguishing between mature cells and immature blast cells, but also to further subtype mature cells. By finding previously unrealized morphological nuance among healthy cells, we hope to predict signs of cancer and disease in routine blood smears, providing early and accurate diagnoses to improve patient outcomes.

Charles Bruder

Oregon State University

MENTORS Alexander Davies, Vaibhav Murthy

Microwave assisted tissue cyclic immunofluorescence (t-CyCIF) for visualization of the tumor microenvironment.

Tissue cyclic immunofluorescence (t-CyCIF) is a highly multiplexed imaging technique that uses repeated cycles of antibody staining, imaging, and fluorophore inactivation to visualize a high number of protein markers in the same tissue section. This method preserves spatial context while enabling detailed analysis of cellular phenotypes and tissue architecture. While t-CyCIF is a powerful technique, the throughput of traditional protocols is limited by lengthy antibody staining times. Microwave irradiation increases the rate of diffusion of antibodies across 3D matrices, allowing for faster staining times. We utilized precision cut lung slices from mice injected with triple negative breast cancer cell lines in order to develop a microwave assisted t-CyCIF protocol, and subsequently analyzed data to assess whether microwave irradiation based protocols improve data resolution compared with benchtop protocols.

Prongbaramee Colling

Oregon State University

MENTORS Dr. Megan Burger, Peter Matulich

Prevalence and determinants of antigen immunodominance in antitumor CD8+ T cell response

The immune response to tumors often narrows on a subset of dominant neoantigens, despite the presence of many potential targets. The Burger lab has shown that these dominant neoantigens can suppress T cell responses to other antigens in lung adenocarcinoma. In this study I investigate what drives the formation of antigen hierarchies in anti-tumor immunity. Using murine models of lung and pancreatic cancers, I compare neoantigen-specific CD8+ T cell responses to assess how competition for peptide-MHC binding shapes antigen hierarchies. I also examine whether immunodominance occurs in pancreatic ductal adenocarcinoma. A deeper understanding of immunodominance guides the design of more effective cancer vaccines to enhance T cell response.

Cassandra Copp

Portland State University

MENTORS Shelley Tworoger, Katy Berns, Jaileene Perez-Morales

Association between social isolation and ovarian tumor gene expression

I am using RNA sequencing data to examine the relationship between chronic stress/distress and immune and inflammatory gene expression in high-grade serous ovarian tumors. Studies in mice have shown that tumor progression can be influenced by activation of the sympathetic nervous system and subsequent release of norepinephrine. This study aims to better understand the role of stress pathway signaling and potential interventions. We combined data collected from two prospective cohort studies to evaluate chronic social stress and distress factors, such as low social integration and widowhood, and the relationship to differential gene expression through Gene Set Enrichment Analysis in ovarian cancer tumor tissue. The results of this experiment will contribute to the larger aims of this grant, which evaluates the relationship between chronic stress/distress and ovarian cancer risk, as well as potential prophylactic interventions with medication use.

Nathaniel Gauvin
Eastern Connecticut State University

MENTORS Zheng Xia, Faming Zhao, Tao Ren

Machine Learning Models to Classify and Provide Insight into Castration-Resistant Prostate Cancer Subtypes

The focus of this project is that development of a machine learning model capable of effectively classifying castration-resistant prostate cancer (CRPC) subtypes. Previous work has required human intervention and performs very limited analysis of samples to perform classification. The models developed for this project have improved accuracy over earlier work, provide substantial biological insight into CRPC subtypes, and can produce meaningful data for downstream analysis and validation.

Grace Huffman
Oberlin College

MENTORS Ece Eksi Ph.D.

Androgen Receptor Splice Variants and Neurexin 1 Expression in Prostate Cancer.

In this study, we are investigating how different splice variants of the androgen receptor (AR) influence the expression of Neurexin 1 alpha (NRXN1α) in prostate cancer. NRXN1α is a presynaptic adhesion molecule essential for synapse formation. Prostate cancer is heavily dependent on AR signaling for growth and survival, and persistent AR activity—particularly through splice variants like AR-V7—contributes to resistance against standard hormone therapies. Our aim is to determine whether NRXN1α expression is regulated by full-length AR, AR splice variant 7 (AR-V7), or both, and to define the role of NRXN1α in AR-dependent growth and therapy resistance.

Daquan Johnson
Bates College

MENTORS Luiz Bertassoni, D.D.S., Ph.D. and Mauricio Sousa, D.D.S., MSc, Ph.D.

Investigating Oral Squamous Cell Carcinoma-Induced Bone Invasion Using a Bone-on-a-Chip Microphysiological Model

This project uses a microfluidic bone-on-a-chip model to study how oral squamous cell carcinoma (OSCC) interacts with mineralized bone tissue. The platform incorporates osteoblasts, osteoclasts, osteocytes, macrophages, and a nanoscale mineralized matrix within a controlled in vitro environment. By mimicking key features of native bone, we aim to uncover the mechanisms driving OSCC-induced bone degradation. Insights gained from this system may inform future therapeutic strategies targeting cancer-induced bone invasion.

Suin (Amy) Jung
Brown University

MENTORS Sandhya Govindarajan, Young Hwan Chang, Ph.D.

Deep Learning-based Confocal Image Interpolation for 3D Representation of Circulating Hybrid Cells

Circulating Hybrid Cells (CHCs) are tumor-derived cells in the bloodstream that evade the bodyâ€™s immune response by co-expressing tumor and immune markers, making them promising biomarkers for cancer progression and metastasis. Most current CHC studies rely on 2D imaging, which cannot fully capture cellular morphology or spatial marker distribution, limiting phenotypic resolution. To overcome these limitations, we utilize 3D confocal microscopy to capture full Z-stacks, providing richer spatial subcellular information; however, this approach requires intensive data acquisition. We address this challenge with deep learning, utilizing frame interpolation algorithms to generate intermediate Z-slices, thereby reducing the number of physical slices required. This approach aims to lower costs, streamline 3D imaging, and expand its accessibility for robust clinical diagnostics and scalable biological imaging.

Carter Kroenke
Haverford College

MENTORS Molly Thomas, M.D., Ph.D.

Tissue-Resident Memory T Cells in Immune Checkpoint Inhibitor-Mediated Colitis

Here, we explore the role of tissue-resident memory T cells (TRMs) in cancer immunotherapy driven colitis (irColitis) using a patient tissue derived organoid model system. Through study of TRM protein expression profiles in organoids generated from healthy and irColitis patient cohorts, we aim to identify specific factors that are associated with incidence of irColitis as a result of immune checkpoint inhibitor therapy.

Kyra Kuelgen
Bryn Mawr College

MENTORS Sanjay Malhotra, Ph.D., Nicholas Struntz, Ph.D.

Synthesis of a Small Molecule Foxp3-drug to Overcome Immunotherapy Resistance

Transcription factor Forkhead box protein 3 (Foxp3) plays a role in modifying the tumor immune microenvironment to evade immune response through suppression of regulatory T-cells (Tregs). To inhibit Foxp3, lead compound CET-FP124-001 has been identified which shows promising manipulation of Tregs to activate cytotoxic lymphocytes. In this study the synthetic pathway to CET-FP124-001 was validated and a small library of analogues were synthesized to analyze compound structure-activity relationships. The aim is to develop an analogue to optimize potency, selectivity, and physiochemical properties to bind to Foxp3 and cause loss of immune suppressor function.

Cooper Lahti
Claremont McKenna College

MENTORS Haijiao Zhang, M.D.

Targeting A1, B4 and B6 Proteasome Core Subunit Vulnerabilities for the Treatment of Partial Chromosome Deletion Cancers.

My project investigates how partial loss (haploinsufficiency) of proteasome subunitsâ€”specifically PSMA1, PSMB4, and PSMB6â€”creates therapeutic vulnerabilities in monosomy associated leukemia. Hemizygous deletion of these subunits may impair proteasome assembly and function, leading to increased sensitivity to proteasome inhibitors like bortezomib, ixazomib, and carfilzomib. By characterizing the effects of PSMA1, PSMB4, and PSMB6 loss on proteasome activity, cell viability, and drug response, this project aims to identify novel synthetic lethal interactions that can be therapeutically targeted in AML and MDS.

Lucas (Luca) Lippert
University of Oregon

MENTORS Stuart Ibsen, Ph.D., Carolyn Schutt-Ibsen, Ph.D.

Dielectrophoretic isolation of extracellular vesicles from 3D-cultured breast cancer cells for biomarker analysis

Breast cancer is the second leading cause of cancer deaths among US women, and characterizing blood-based biomarkers for early detection is crucial for improving clinical outcomes. Triple negative breast cancer (TNBC) cells secrete extracellular vesicles (EVs) into circulation that play a crucial role in driving tumor progression and metastasis. The challenge is to identify EV-laden biomarkers in early-stage cancer and recover them from patient plasma for analysis. However, EVs are notoriously difficult to isolate. Dielectrophoresis (DEP) is a means to separate submicron particles from complex solutions, and involves the movement of particles through a medium as a response to a nonuniform electric field. Our goal is to apply DEP for collecting and analyzing EVs secreted by TNBC cells in 3D model systems that replicate important aspects of the tumor microenvironment. We first visualize the EVs using transmission electron microscopy; and nanoparticle tracking analysis reveals an average concentration of 10^9 to 10^10 particles/mL. DEP provides a novel method for characterizing EV-laden biomarkers and assessing TNBC EV secretion in 3D model systems.

Janani Maheswaran
University of Washington, Seattle

MENTORS Lisa M. Coussens, Sam Sivagnanam, Wes Horton, Nell Kirchberger

Combination Therapy with HDAC Inhibition Reprograms Tumor and Immune Metabolism in Murine Breast Cancer Model

My project uses spatial proteomics to investigate metabolic reprogramming in the tumor microenvironment within a triple-negative breast cancer (TNBC) mouse model. We will evaluate how the addition of a histone deacetylase inhibitor (HDACi) affects combination therapy, with standard-of-care chemotherapy, macrophage inhibition, and immune checkpoint blockade. This study contributes to understanding how epigenetic modulation of metabolic pathways can lead to enhanced antitumor efficacy.

Blanca Martinez-Herrera
Wellesley College

MENTORS Angelina Vaseva, Ph.D., Arnab Sarkar, Ph.D

Uncovering the effect of SHOC2 knockdown on Avutometinib response in Neurofibromatosis-1 associated Malignant Peripheral Nerve Sheath Tumors

In my project, I will be studying the effects of SHOC2 knockdown in combination with Avutometinib treatment on Neurofibromatosis-1 cells associated with Malignant Peripheral Nerve Sheath Tumors. The goal of the project is to provide reasoning for improved therapeutic strategies.

Jolie Nguyen
Lewis & Clark College

MENTORS Tanaya Shree, M.D., Ph.D., Matthew Stern

Evaluating Ibrutinib's ability to inhibit Tr1 cells, negating immune suppression in the tumor microenvironment

Tr1 cells are a subset of T regulatory cells that are cytotoxic towards antigen-presenting cells and release high amounts of the immune-suppressing cytokine IL-10. In a lymphoma immunotherapy trial using ibrutinib, a multi-kinase inhibitor, Tr1 populations were reduced. Ibrutinibâ€™s effects on Tr1 cells are unknown. In this study, I investigate how Ibrutinib affects the differentiation of Tr1 cells from primary human naÃ¯ve CD4 T cells ex vivo. The long-term aim is to understand the mechanisms by which Ibrutinib impairs Tr1 viability and/or function and to design Tr1-targeted therapies.

Keishly Pagan
University of Puerto Rico at Humacao

MENTORS Teresa Zimmers, Ph.D., Rafael Correia, Omnia Gaafer

DHTKD1 Overexpression and Metabolic Modulation of Cachexia in Pancreatic and Colon Cancer Models

Cachexia is unintentional weight loss due to anorexia, dysmetabolism, and inflammation induced by tumors. Our lab found that B6.ABJ-Prkcqrpea1 mice, which are protected from pancreatic cancer cachexia, had greater expression of the hepatic lysine metabolizing enzyme, DHTKD1 and correspondingly reduced levels of the metabolic intermediate a-aminoadipic acid (a-AAA) versus wild-type C57BL/6J mice. C57BL/6J mice have hypomorphic Dhtkd1 alleles. Because a-AAA administration is known to produce cachexia-like phenotypes, we asked whether Dhtkd1 gene therapy could lower a-AAA and improve cachexia in C57BL/6J mice. We also sought to measure DHTKD1 and a-AAA in a related model of cachexia, C26 colon carcinoma, in CD2F1 mice, with or without the anti-cachexia treatment, olanzapine. Through these functional studies, Western blotting for DHTKD1, and mass spectrometry for lysine and a-AAA, we will determine whether hepatic Dhtkd1 could be a modifier of PDAC cachexia development.

Mira Rajagopalan
University of Texas at Austin

MENTORS Olga Nikolova, PhD., Natasha Black, MS.

Drug Response Prediction Methods on Single-Cell Primary Cancer Data

Most cancer therapies have variable responses in patients due to intra- and inter-patient heterogeneity, making it difficult to determine a patients potential response to a treatment. Computational approaches have been developed to model targeted perturbation effects using information collected from perturbation screens, however how these approaches fare on patient-derived data is currently unknown. In this project, I evaluated scGen, a variational autoencoder model, in the context of various algorithms for predicting drug response. The aim is to establish a benchmark that will identify which methods work well or perform poorly and in which scenarios. The findings of this study will be used to identify areas where improvements are needed for successful application to patient samples. This will allow predictions of drug response in patients without experimental testing which is costly and can be prohibitive while improving the efficiency and accuracy of choosing treatments for patients.

Colin Scales
Universuty of Oregon

MENTORS Andrew Emili, Jacob Porter

Designing a High-Throughput Assay for Untargeted Drug Discovery

In this study, I attempt to create an assay for high-throughput, untargeted drug screening using proximity labeling. Small-molecule drugs are covalently attached to photoactivatable linkers, then immobilized on NHS plates or magnetic beads. When exposed to UV light and a photocatalyst, nearby proteins are covalently labeled via carbene chemistry. Fluorescence and mass spectrometry are used to monitor binding and labeling. This approach aims to rapidly identify drug-protein interactions and improve early-stage drug discovery.

Oshiana Schenkelberg
California State University, Long Beach

MENTORS Haijiao Zhang, M.D.

Investigating the Mechanism of Enhanced Proteasome Inhibitor Sensitivity Mediated by PSMB9 Overexpression

Proteasome inhibitors (PIs) like bortezomib and ixazomib are effective in hematologic malignancies but show limited efficacy in solid tumors due to resistance mechanisms. Leukemia cells with chromosome 7 deletions exhibit increased sensitivity to PIs, in part through haploinsufficiency of proteasome subunits such as PSMA2. Expanding this, we identified PSMB9, an immunoproteasome subunit, whose overexpression significantly enhances PI sensitivity across a panel of leukemia cell lines. We found that PSMB9 protein levels are negatively correlated with PSMB6 expression levels. Mechanistically, PSMB9 overexpression reduces PSMB6 protein levels post-translationally, as PSMB6 mRNA levels are not altered. PSMB9 mRNA expression does not seem to correlate with copy number, but rather, with promoter methylation levels. This study will identify PSMB9 overexpression as a predictive biomarker for Proteasome inhibitor responsiveness, providing a potential stratification tool for clinical application.

Precious Khan Wondzi
Salem College

MENTORS Emma Wolcott, Arslan Ahmed, Ellen Langer

Matrix Stiffness Mediated Modulation of YAP Localization and KRAS-Inhibitor Sensitivity in KPC Pancreatic Cancer Cell Lines

Pancreatic ductal adenocarcinoma (PDAC) harbors a stiff, fibrotic tumor microenvironment that governs cancer cell behavior. The transcriptional regulator YAP translocates to the nucleus in response to increased matrix stiffness, activating genetic pathways that promote proliferation and survival. KRAS and YAP may act in compensatory pathways. Kapoor et al. showed that resistant cells activate YAP to drive proliferation. We hypothesize that KRAS inhibition enhances YAP nuclear localization in stiff environments, enabling survival through alternative signaling routes and promoting therapy resistance. Using KPC pancreatic cancer cell lines cultured on substrates with varying stiffness levels (2, 50, 100 kPa), I will investigate how varying matrix stiffness impacts YAP localization and response to KRAS-inhibition. This study aims to examine the interaction between mechanical cues and oncogenic signaling in regulating YAP-driven resistance in PDAC.

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.

Hemanth Kapa
Dickinson College

MENTORS Benjamin Barad Ph.D.

Visualizing Early Clathrin-Mediated Endocytosis During Listeria Infection via Cryo Electron Tomography

Clathrin-mediated endocytosis (CME) is a critical pathway exploited by pathogens like Listeria monocytogenes to invade host cells. Listeria is a medically significant intracellular bacterium responsible for severe foodborne illness, particularly in immunocompromised individuals, pregnant women, and the elderly. Understanding how Listeria invades epithelial cells is crucial for developing interventions to prevent and treat infection. This project focuses on optimizing a workflow to capture early CME events during Listeria infection in HeLa cells using cryogenic electron tomography (Cryo-ET). Although Listeria naturally targets intestinal epithelial cells, HeLa cells are used here due to their shared epithelial characteristics and their widespread use in medical research. This literature enables direct comparison and contextualization of our findings, especially as other members of our lab investigate infection in novel sample types.

Alex Lim
Brown University

MENTORS Benjamin Barad Ph.D.

Characterizing Shigella-Induced Membrane Remodeling: Biomolecular Localization Trends During Macropinocytosis

Shigella flexneri (hereafter referred to as Shigella) targets colon epithelial cells and uses a type III secretion system (T3SS) to deliver a cocktail of effector proteins. This manipulates host cell pathways to form a bacteria-containing vacule (BCV) and nearby macropinosomes, which assist with early-stage infection by breaking the BCV. Host cell biomolecules like phosphoinositide phosphates (PIP lipids) and sorting nexins (SNX) help to recruit f-actin to the site of infection, inducing macropinocytosis. In this study, Caco-2 cells expressing fluorescent PIP3 probes were seeded on coverslips, fixed after 24 hours, and stained for SNX9 or f-actin, with or without infection by GFP-expressing Shigella; confocal microscopy and Fiji were then used to image and quantify fluorescence to visualize the localization of the biomarkers. These insights may uncover novel host-pathogen interactions in Shigella and inform future therapeutic targets for antibiotic-resistant Shigella strains.

Misgana Merid
Oregon State University

MENTORS Show-Ling Shyng Ph.D.

Making sense of nonsense: Functional rescue of congenital hyperinsulinism-causing premature stop codon mutations in KATP channels using Anticodon Edited tRNAs

Congenital hyperinsulinism (HI) is a genetic disorder in which pancreatic β-cells secrete excessive insulin, causing severe hypoglycemia. It often results from loss-of-function mutations in ATP-sensitive potassium (KATP) channels, which are composed of the regulatory SUR1 subunit (ABCC8) and the pore-forming Kir6.2 subunit (KCNJ11). Nonsense mutations in ABCC8 introduce premature termination codons (PTCs) that prevent full-length SUR1 protein expression, leading to non-functional channels and unresponsiveness to diazoxide, the only FDA-approved KATP activator. These mutations account for ~10% of all HI-associated KATP mutations and primarily affect the SUR1 subunit, which is too large for conventional gene therapy. Anticodon-edited tRNAs (ACE-tRNAs) are edited tRNA molecules that recognize PTCs and insert specific amino acids, allowing translation to continue and restore full-length protein. ACE-tRNAs offer a promising strategy to treat genetic diseases caused by nonsense mutations.

Annika Merten
George Fox University

MENTORS Beth Habecker Ph.D.

The effect of p75NTR inhibition on cardiac innervation after AngII induced hypertension.

Angiotensin II (Ang II; 700 ng/kg*min) hypertension leads to loss of sympathetic nerves in the heart. AngII stimulates oxidative stress, which can stimulate axon degeneration in sympathetic neurons through cleavage of p75 neurotrophin receptor (p75NTR). We hypothesize that AngII induced oxidative stress triggers sympathetic neurodegeneration via p75NTR. To determine if activation of p75NTR stimulates axon degeneration in the heart, mice were treated with AngII (400 ng/kg*min) ± LM11A-31 (20 mg/kg) and sympathetic nerves were quantified using immunohistochemistry for tyrosine hydroxylase. This dose of AngII generated moderate hypertension, but did not lead to decreased cardiac output or significant oxidative stress. Nerve density was not decreased by AngII treatment at this dose, with or without LM11A-31. This is consistent with a potential role for oxidative stress in causing axon degeneration, but further studies with a higher dose of Ang-II are required to test the role of p75NTR.

Spencer Pardee
Taylor University

MENTORS Beth Habecker Ph.D.

Quantifying Angiotensin II's Effects on Sympathetic Nerves in the Kidneys

Objective: Previous studies have shown that an elevated Angiotensin II (AngII) leads to sympathetic nerve loss (denervation) in the heart. The focus of this study aimed to determine if Ang II has a similar effect on sympathetic nerve fibers and norepinephrine concentration in the kidneys.

Methods: Mice were implanted with osmotic minipumps releasing AngII (400ng/kg*min) for 7 days, after which the kidneys were taken and nerve density was quantified using immunohistochemistry for Tyrosine Hydroxylase, oxidative stress was quantified staining for XX, and Norepinephrine was quantified by HPLC.

Results: This dose of AngII caused moderate hypertension, but HPLC and IHC data suggest no change in nerve density.

Acknowledgements: This work was funded by The American Physiological Society Summer Undergraduate Research Fellowship Program and NIH (Grant # HL093056).

Maggie Reitze
Whitman College

MENTORS Michael Cohen Ph.D.

Overcoming PARP Inhibitor Resistance with Next-Generation PARP Inhibitors

To date, four PARP inhibitors have been approved by the FDA as maintenance therapy for cancer with BRCA1 or BRCA2 deficiency, but resistance to these inhibitors frequently emerges through BRCA reversion mutation. Next-generation (type I) PARP inhibitors overcome resistance by enhancing PARP1-DNA binding through allosteric modulation, through a form of "trapping" that is distinct from currently available PARP inhibitors, offering the potential to selectively target BRCA revertant cancer cells. Here, we hypothesized that type I PARP inhibitors overcome resistance through reduction of homologous recombination and thus would not be synergistic with inhibitors preventing homologous recombination response.

Zoran Reese
Whitman College

MENTORS Braden Lobingier Ph.D.

Regulation of Mu opioid recycling and signaling

G protein-coupled receptors (GPCRs) are important for many aspects of human physiology, making up approximately 35% of approved drug targets. The ability for GPCRs to elicit physiological responses is through signaling, which is dependent on receptor presence at the plasma membrane. GPCR signaling is regulated through a process known as cellular trafficking. Following stimulation with an agonist, GPCRs are internalized into endosomes and a GPCR can either be transported to the lysosome for degradation, driving receptor downregulation and the development of tolerance, or recycled from the endosome back to the plasma membrane, allowing for resensitization of the receptor. There are many proteins that are involved in determining which route a GPCR takes. The mu opioid receptor (MOR) is a recycling receptor that requires an endosomal sorting protein complex, Retromer, to recycle from endosomes. Retromer shares similar structural properties to Barrestin, a protein which has been shown to initiate arresting of signaling and internalization of many important GPCRs. Due to these similarities, we predict that Retromer also shares functional properties with B-arrestin.

Jordan Sandler
Oregon State University

MENTORS Michael Cohen Ph.D. and Joseph Aslan Ph.D., FAHA

Target identification of a tetrazole-based mitochondrial permeability transition pore (mPTP) inhibitor

Platelet phosphatidylserine (PS) exposure is regulated by numerous effectors, including the mitochondrial permeability transition pore (mPTP). Traditional mPTP inhibitors like cyclosporine A (CsA), which targets cyclophilin D (CyPD), are not ideal for clinical translation due to their immunosuppressive effects. To address this challenge, a novel tetrazole-based small molecule was synthesized to inhibit mPTP independently of CyPD.

Ella Yarris
St. Olaf College

MENTORS Meghna Gupta Ph.D.

Exploring cancer drug-resistance through human ABCD3 interactions with oxaliplatin

Peroxisomes are organelles found in eukaryotic cells that carry out metabolic oxidation, detoxification of the cell, and biomolecule synthesis through a variety of enzymatic pathways. Peroxisomal membrane proteins (PMPs) are responsible for the transport of metabolites into and out of the peroxisome, which is crucial for organelle function. ABCD3, the most abundant peroxisomal membrane protein, has been implicated in drug resistance to oxaliplatin (L-OHP) in human colorectal cancer cells. We used ATPase assays and biophysical binding techniques to characterize ABCD3 and oxaliplatin interactions in vitro, which potentially contribute to drug resistance.

CRUMPLER INTERNSHIP

The Crumpler Internship is a two-summer high school internship experience through the Department of Surgery. Our participant performs as a research volunteer working with OHSU's Orthopedics Department.

Mekhi Gardner

De La Salle North Catholic High School, Portland

MENTORS Eneida Nemecek, MD, MS, MBA and Khanh P. Nguyen, MD, MCR

Hot Spots & Blind Spots: Mapping and Analyzing Access to Clinical Trials

This project takes a closer look at who is participating in cancer clinical trials at the Knight Cancer Institute and who might not be. Using geographic heat maps supplemented with disaggregated statistical analysis, it highlights patterns in trial enrollment that may indicate gaps in access. The goal is to provide an evidence-based overview that informs where further analysis, targeted outreach, or resource allocation may enhance trial participation.

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 Adem Yildirim, Ph.D.

Developing a PEG-Fluorophore Conjugate

Fluorescence guided surgery is an imaging technique that lets a surgeon visualize specific things like tumors, growths, blood vessels, and others through the use of fluorescent dyes. This technique is useful especially in cancers like glioblastoma, an aggressive and infiltrative cancer, that has a risk of recurrence correlating to the degree of surgical resection. We already have some optical imaging agents however they do not specifically target tumors. The lack of specificity shows the need for improved optical imaging agents for fluorescence guided surgery. Since cancer cells have a high lipid metabolism, it is proposed that we can use lipoproteins to target tumors. Our lab has developed an amphiphilic peptide fluorophore conjugate, SAE-ICG, that uses lipoproteins to target tumors. Our goal is to replicate this optical imaging agent with a fluorophore conjugate that has a hydrophilic PEG backbone and a hydrophobic carbon chain to make a biocompatible, soluble, and hydrophilic tumor targeting fluorophore.

Grace Ramazani

David Douglas High School

MENTORS Chris Eide

Combining CLAD+LDAC+VEN Targets Multiple Differentiation States in AML

Acute Myeloid Leukemia (AML) is a blood cancer resulting from dysregulated hematopoiesis, leading to the accumulation of immature myeloid cells. For elderly or unfit patients who cannot tolerate intensive chemotherapy, the standard treatment is a combination of a hypomethylating agent (HMA, such as azacitidine) and the BCL2 inhibitor venetoclax. However, not all patients respond: responders typically have a primitive (stem-like) cell state, while non-responders exhibit a more differentiated (monocytic) state. Recent studies highlight that monocytic AML cells, which are resistant to HMA+Ven, may be sensitive to the purine analog cladribine, either alone or in combination with venetoclax.

Jade McDonald

Hudsons Bay High School

MENTORS Steve Kurtz, Ph.D.

Analyzing the Reproducibility of a Rapid Gene Expression Assay to Predict Venetoclax Response in Acute Myeloid Leukemia

Acute myeloid leukemia (AML) 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. This mutation causes the cell to multiply rapidly. The resulting abnormal cells also develop resistance to apoptosis. Consequently, these cells not only multiplying at an accelerated rate but also do not undergo programmed cell death as they should when a mutation occurs. This leads to the accumulation of abnormal cells, which crowd out healthy cells and enter the bloodstream, which then develops symptoms such as fatigue, headaches, and dizziness in the patient. The heterogeneity of AML, which varies significantly from patient to patient, complicates its treatment. This summer my goal is to deeply understand gene expression and understand the process of Myelo-ID, a developing project to help with the treatment plan of AML patients by characterizing their gene expression with respect to standard of care treatments.

Tenzin Dorjee

Beaverton Academy of Science & Engineering

MENTORS Kimberly E. Beatty, Ph.D.

Characterization of a putative β-Lactamase, Mab_4800, expressed by M. abscessus

Mycobacterium abscessus is a fast-growing bacterium that causes lung infections, particularly in individuals with cystic fibrosis or other chronic lung diseases. It is tough to treat because it is resistant to most antibiotics, including a group called β-lactams. These antibiotics usually kill bacteria by blocking cell wall production. However, M. abscessus produces enzymes known as β-lactamases that hydrolyze and inactivate these drugs. One of the β-lactamase enzymes in M. abscessus is MAB_4800. This enzyme is uncharacterized but is a putative β-lactamase. I propose to characterize the β-lactamase activity of Mab_4800

Allyson Garcia

Liberty High School

MENTORS Summer L. Gibbs, Ph.D.

Enumeration of Circulatory Hybrid Cells from KPC8060 Tumor-Bearing Mice

The standard theory was that cancer spread through the body via blood. It was believed that tumor cells would break off from the main tumor and travel through the blood and into a new location. Yet regardless of how much blood work was done on cancer patients, tumor cells just did not appear in the blood. However, new research discovered that it was much complex. It has been uncovered that cancer likely spreads via irculatory hybrid cells (CHC)—cells that are half tumor and half immune--rather than simply tumor cells. Through the collaboration of multiple labs, there is constant investigation to get a better grasp of these CHC. It is believed that research into CHC will hopefully lead to earlier cancer detectionin patients, as well as offer insight into the best path for treatment.

Emely Perez Quintana

Woodburn High School

MENTORS Gaurav Sahay, Ph.D.

Development and evaluation of tumor-targeted mRNA lipid nanoparticles for effective treatment of cancers

Lipid nanoparticles have been designed for mRNA delivery. LNPs create a stable platform to deliver; medicine, mRNA or to start gene editing. LNPs to treat cancer patients has been ongoing research. LNPs first great successes was used for the COVID19 vaccines. Currently, LNPs are being experimented on to see if a platform for its connection to target tumors can be formed. LNPs have been tested clinically and have successfully and safely delivered mRNA payloads to target different tissues and cell types. Although LNPs are a promising tool, it still has become hard to create a platform to use LNPs for tumors.

Josue Lopez-Reyes

Rex Putnam High School

MENTORS Jacob Raber, Ph.D.

Relationship between diet, gut microbiome, and cognition in Prostate Cancer Survivors on Androgen Deprivation Therapy

Apolipoprotein E drives cholesterol metabolism. Humans carry three apoE isoforms in humans, E2, E3, and E4. Compared to E3, E4 increases the risk to develop cardiovascular and Alzheimer's disease. Lifestyle-related factors impact the relationship between apoE isoform and cancer-related toxicity. Exercise protects E4 carriers having other medical conditions. Exercise can reduce side effects during cancer treatment, lower the risk of cancer recurrence, and improve quality of life in cancer survivors. Exercise has cardio-metabolic benefits and may attenuate the increased risk of cardiovascular disease following cancer treatment. The gut microbiome interacts with the brain to contribute to health and disease. In prostate cancer patients that received androgen deprivation therapy (ADT), the gut microbiome can generate testosterone and enhance prostate cancer growth.

Laila Wahab

Lake Oswego High School

MENTORS Conroy Sun, Ph.D.

Development of PEGylated Liposome-Based Platforms for Effective Delivery of Hydrophobic Small Molecules for Anti-Cancer Applications

Liposomes are extremely small particles that can be engineered with different properties for drug delivery in cancer. Certain nanoparticles can be made of iron or made to release iron in order to induce ferroptosis, which is a regulated cell death that is iron-dependent and characterized by abnormal intracellular accumulation of lipid peroxides. This form of cell death is distinct from other mechanisms such as apoptosis, necrosis, and autophagy. By inducing ferroptosis, mitochondrial dysfunction and toxic lipid peroxidation in the cells are derived. These processes both play a pivotal role in suppressing cancer growth.

Lydia Yihdego

David Douglas High School

MENTORS Joshua Moreau, Ph.D.

Modeling Tertiary Lymphoid Structure Formation in Cancer

Tertiary lymphoid structures (TLS) are organized hubs of interacting immune cells that form in response to inflammation in specific areas of the body, such as tumors. Their presence has been linked to improved clinical outcomes, as patients with a higher abundance of mature TLS often show better prognoses and greater responsiveness to therapy compared to those with fewer or less developed TLS. While it is known that TLS progress through distinct stages of development, the mechanisms underlying their maturation are not well understood. A TLS is considered mature when it contains a germinal center, a specialized structure that plays a critical role in modulating B cell affinity maturation and differentiation, thereby enhancing the body's immune response.

Mario Olvera Vasquez
Beaverton Academy of Science & Engineering

MENTORS Kyle Ellrott, Ph.D.

Using Deep Learning Techniques to Understand HLA–Peptide Binding Patterns

The human immune system plays a crucial role in defending the body against cancerous cells. A powerful method of detection that the immune system uses stems from neoepitopes. Neoepitopes are the products of mutated genes. These foreign, mutated proteins have the potential to elicit an immune response if they can be marked and detected. Neoepitopes are the result of proteolysis of somatically altered proteins; these are peptides that are typically around 8-11 amino acids in length. These neoepitope peptides are then transported by TAP molecules to the ER, where they can potentially bind to HLA proteins. If binding is successful, the HLA peptide complex moves to the cell's surface, where the T-cell receptors can engage—beginning an immune response towards that cancerous cell [1]. Neoepitope binding candidates are highly personalized as they depend on each person's cell mutations and HLA allele type. The HLA gene is one of the most varied, displaying a high level of polymorphism in our populations [4]. Furthermore, the amount of neoepitopes that lack immunogenicity heavily outweighs those that do. Thus, finding an immunogenic neoepitope for a specific individual is a difficult task.

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. The internship tracks are: Biomedical Sciences, School of Medicine, School of Dentistry, and School of Public Health.

Emma Aguilar Torres
Oregon State University

MENTORS Carolyn Schutt Ibsen, Ph.D., Kira Lynch, B.S.

Developing a Model of Early Breast Cancer Using Ultrasound Responsive Microbubbles in a 3D Hydrogel

Breast cancer affects 1 in 8 women in their lifetime in the United States. To properly identify methods for detection and treatment of early-stage cancer, it is vital to create in vitro model systems that replicate important physical aspects of the tumor microenvironment. Ultrasound-responsive gene delivery microbubbles have previously been utilized by our group to spatiotemporally control transfection of cells in 3D matrices. This project aims to assess ultrasound-activated microbubble gene delivery efficacy in different concentrations of gelatin methacrylate (GelMA) hydrogels with different architectures, such as bulk hydrogels and hydrogels with hollow channels (mimicking vascular structures) to create 3D early cancer models.

Camila Cardozo
St. Mary's University

MENTORS Summer Gibbs, Ph.D.

Design and Optimization of an Antibody Panel for Rare Cell Detection in Tissue Using Cyclic Immunofluorescence

Circulating Hybrid Cells (CHC) are newly discovered cells with both immune and tumor cell phenotypes. These cells are detectable in the peripheral blood of patients and may serve as a potential indicator of treatment response and metastatic risk. By using cyclic immunofluorescence, we aim to identify hybrid cells in tumors, blood and metastases, as well as correlate their abundance and localization with various cell markers to probe the underlying hybrid cell biology. To achieve this, we designed a fluorophore-conjugated antibody panel with photocleavable fluorophores, allowing us to quantify the abundance of different biomarkers through several rounds of staining and imaging while avoiding tissue damage. Through this work, we hope to characterize CHC populations and key aspects of their biology at different stages of dissemination, furthering our understanding of their role and biological changes during the metastatic cascade.

Jessica Chavez Chairez
Oregon State University

MENTORS Stuart Ibsen, Ph.D.

Isolation of Cancer-Associated Nanoparticles From Cerebrospinal Fluid Using Dielectrophoresis

Early cancer detection and treatment significantly improves survival rates. Current diagnostic methods are often invasive and time consuming, exemplifying the need for faster clinically-translatable early cancer detection methods to improve patient outcomes. Analyzing extracellular vesicles (EVs), biological nanoparticles secreted by cancer cells, is an emerging technique for early cancer detection. EVs carry tumor-specific molecular signatures such as tumor antigens and nucleic acids, providing vital information on tissue of origin as well as cancer type and stage. Recovery of EVs, traditionally time-consuming, is possible with microfluidic chips that employ dielectrophoresis (DEP) technology. DEP chips exert nonuniform electric fields to isolate target nanoparticles for analysis and characterization. These chips have been used to recover cancer biomarkers in patient plasma samples, and this project expands on previous work by isolating EVs from cerebrospinal fluid (CSF) samples. CSF circulates throughout the CNS, reflecting biochemical changes, making isolation and analysis of EVs from CSF a promising avenue for early detection of CNS cancers.

Cherry Chen
Johns Hopkins University

MENTORS Daniel Zuckerman, Ph.D.

Uncovering Low-Dimensional Patterns in Cancer Genomics

Cancers are recognized as highly individualized diseases, shaped by patient-specific genetic mutations and epigenetic changes. This project explores the hypothesis that cancer, as a disease state, may be low-dimensional, meaning a relatively small number of latent variables may be sufficient to capture the major patterns of disease progression. Using data from the Clinical Proteomic Tumor Analysis Consortium (CPTAC), we apply multivariate regression and dimensionality reduction techniques to identify key molecular features with high predictive power. Our findings could support the development of universal biomarkers to work on generalizing cancer treatment.

Annabel Jensen
Portland State University

MENTORS Angela Ozburn, Ph.D.

Nucleus Accumbens Projections and Whole Brain c-Fos Induction in Response to Binge-like Ethanol Drinking in High Drinking in the Dark line 1 Mice

Drinking alcohol to intoxication ("binge drinking") increases the risk of developing an Alcohol Use Disorder (AUD). We determined which brain regions are engaged in binge-like drinking using inbred HDID-1 mice. To determine which regions are engaged, we measured brain-wide levels of c-Fos, an immediate early gene used as a proxy for cellular activity after 4 days of Drinking in the Dark. Following binge like ethanol drinking, 67 regions had significantly lower, and 1 region had significantly higher c-Fos expression, compared to water drinking mice (n=17-21/sex/fluid). These results reveal novel and lateralized regions of interest involved in binge-like drinking in a mouse genetic model of risk for drinking to intoxication. We also identified that there were more brain regions with projections into the nucleus accumbens (a brain region we know is important for the development of AUD), engaged following binge-like ethanol drinking as compared to water drinking. Supported by the NIH (AA030908, AA030806, AA010760, AA013519, AA007468) and the US Department of Veterans Affairs (I01 BX004699).

Ayo Kayode-Popoola
Oregon State University

MENTORS Jonathan Pruneda, Ph.D.

Decoding viral DUBs: Investigating non-canonical ubiquitin signals regulated by Herpesviruses

Pathogens often hijack their host's ubiquitin system removing, inserting, and supressing signals to evade immune defenses. Recent discoveries have shown that some viruses can manipulate non-canonical ubiquitin linkages—modifications not attached to the typical lysine residues. This project investigates the substrate specificity of deubiquitinases (DUBs) from different Herpes Simplex Virus (HSV) strains to uncover how these viral enzymes recognize and remove non-traditional ubiquitin signals. By expressing and purifying DUBs and assessing their activity on various substrates, this work aims to provide new tools for studying ubiquitin signaling and deepen our understanding of viral pathogenesis.

Thao Le
University of California - Davis

MENTORS Hui Wu, Ph.D.

Different Bacterial Species Disrupting Streptococcus mutans and Candida albicans Symbiotic Relationship in Multispecies Oral Biofilm

Streptococcus mutans is the primary pathogenic bacterium responsible for cavities. Commonly seen in early childhood caries (ECC), Streptococcus mutans forms a mutualistic relationship with the fungus Candida albicans, contributing to increased disease severity. The glucans produced by S. mutans' glucosyltransferases (GTFs) physically interact with the mannans of C. albicans, enhancing the dual-species biofilm's thickness, adhesion, and overall virulence. In addition to these pathogens, other commensal bacteria inhabit the oral microbiome. Using multispecies biofilm assays, we aim to investigate how various bacterial species interact and potentially disrupt the pathogenic relationship between S. mutans and C. albicans.

Michelle Lopez Padilla
University of Oregon

MENTORS Lauren Rodda, Ph.D.

Investigating the Role of Extrinsic and Intrinsic Factors in Upper Respiratory Tract Memory B Cell and Splenic Memory B Cell Humoral Response

Memory B cells (MBCs) rapidly trigger host humoral immune defense by differentiating into antibody secreting cells (ASCs). Upon a second encounter of an influenza antigen, memory B cells that reside in the upper respiratory tract (URT MBCs), have been found to pursue an ASC fate to a faster and greater extent than circulating MBCs. As a newly recognized MBC subset, the exact mechanisms of URT MBC activation upon influenza rechallenge is unknown and calls for investigation. We are specifically interested in revealing whether it is an extrinsic or intrinsic factor that influences the extent of URT MBCs differentiation into ASCs. To answer this question, we will isolate URT MBCs from mice, and culture and stimulate them in three separate niches (URT tissue, splenic tissue, or no tissue) to determine if the URT niche is necessary for driving URT MBC to an ASC fate, as seen in-vivo. We will perform this same process for spleen cells to determine if the URT niche is sufficient to alter the ASC fate of non-URT MBCs. Our results would be useful in developing influenza vaccines that target URT MBCs for efficient host protection.

Qiying Ma
Oregon State University

MENTORS Suzanne Fei, Ph.D.

Disentangling Blood vs. Brain Signals in Alcohol-Induced Gene Expression in Rhesus Macaques

The non-human primate model is critical for understanding alcohol use disorder (AUD). This project investigates whether alcohol-induced gene expression changes in the brain are primarily driven by blood-based signals or by brain tissue itself. Using RNA sequencing data from rhesus macaques with long-term alcohol exposure, we compare gene activity in prefrontal cortex samples collected pre-perfusion (with blood) and post-perfusion (after blood removal). Through bioinformatics analysis of approximately 600 genes, we aim to identify differences in signaling pathways related to chronic alcohol use, which may inform the development of more targeted therapeutic strategies.

Aali Maldonado
University of Washington

MENTORS Esther Choo, M.D., M.P.H.

Naloxone Distribution in the Emergency Department following SB 1043

The Opiod Epidemic continues to drive unprecedented increases in morbidity and mortality. Emergency departments (ED's), such as OHSU, are often the initial and sometimes only point of care for individuals experiencing opioid-related crises. Naloxone is an opioid antagonist that can rapidly reverse the effects of opioid toxicity, which has become a critical tool in the clinical and public health response to the Opioid Epidemic. Despite widespread support for Naloxone distribution, evidence suggests that access is not equitably distributed across all patient populations. This study aims to evaluate the implementation and impact of Naloxone distribution practices in OHSU's ED's following the passage of Oregon Senate Bill 1043. Specifically, we will conduct a retrospective analysis of Electronic Health Record (EHR) data to assess whether demographic factors and socioeconomic status are associated with differential rates of Naloxone distribution. By identifying potential disparities, this study seeks to inform equitable clinical practices and support system-level changes that reduce opioid-related harm and improve outcomes for underserved populations.

Araylia-Marie Martinez
Clark College

MENTORS Monica Hinds, Ph.D.

Modeling Magnesium Surface Protein Adhesion to Assess Hemocompatibility

Bioresorbable stents (BRS) are an emerging medical device that treats cardiovascular disease due to its ability to preserve patency and dissolve overtime, minimizing health risks associated with non-BRS. In previous research conducted in the Hinds laboratory, magnesium-based stents have been observed to have a decreased amount of platelet deposition in comparison to other bioresorbable materials. This project seeks to assess the relationship between magnesium's surface properties and fibrinogen, a plasma protein, to develop an understanding of its hemocompatibility. A protein adhesion assay was utilized with fluorescent stained fibrinogen and magnesium samples, with the inclusion of brass and stainless-steel controls to assess how the protein deposits on the exterior of various materials. Development of magnesium's properties and mechanisms involving thrombus components, such as proteins and platelets, is necessary to understand the compatibility of the potential BRS material.

Sydney McFarlane
University of Maryland

MENTORS Charlotte (Charlie) Roscoe, Ph.D.

Advancing Green Care and Mental Health Equity in Multnomah County, Oregon

The GreenME project is based in Europe and the U.S. and is focused on the expansion of green care and nature-based therapies to improve mental health equity, while promoting environmental co-benefits and social justice. GreenME in the U.S. case study region—Multnomah County, Oregon—has documented the current status of green care, and is continuing to increase the evidence on the benefits green care at three scales on mental health and wellbeing equity (i.e., population-, community-, and individual-level equitable access to green and blue spaces, nature-based programs and therapies), and, last, GreenME is co-developing strategies with green care actors and decision makers to amplify green care for mental health equity. This project has identified, evaluated, and mapped the status of GreenME stakeholders and their service locations in Multnomah County, Oregon. It also assesses the core opportunities and barriers related to the integration of the three green care scales for equitable mental health benefits.

Taylor Montgomery
The University of Georgia

MENTORS Isabella Rauch, Ph.D.

NLRC4 induction in human intestinal epithelial cells (IECs) and IEC's differentiation to enteroendocrine cells

The NAIP/NLRC4 inflammasome is employed by the innate immune system to fight several infections. In mouse intestinal epithelial cells, Naip/Nlrc4 is well expressed and functional. However, in adult human IECs (hIECs), the expression of NAIP/NLRC4 is very low and non-functional. Despite this, studies show a mutation in the NLRC4 gene can cause symptoms of enterocolitis in early life, suggesting that it may be functional in hIECs. Transcription factor analysis identified OLIG1 as one of the transcription factors that can bind to NLRC4. So, here we try to induce NLRC4 expression by adding factors that induce OLIG1. In addition, sequencing data suggests NLRP1, another inflammasome, is expressed primarily in enteroendocrine cells (EECs) in the intestine. So, to study this inflammasome we need a model where we can differentiate intestinal stem cells into EECs. Hence, using several inducers and inhibitors of gut signaling pathways we aim to differentiate intestinal stem cells into EECs.

Austin Murray
Oregon State University

MENTORS Suzanne Mitchell, Ph.D.

Valuing the Past: Discounting Past Health, Everyday Life, and Substance Use Events

This project investigates how individuals discount the value of past events using a scenario-based task developed in Qualtrics. Participants evaluate experiences (ranging from health-related to substance use and everyday scenarios) at different time points in the past, allowing us to measure how they assign value across retrospective timelines. While most discounting research focuses on future outcomes, little is known about how people perceive and devalue past experiences. Understanding these patterns is especially important in the context of substance use disorders, where diminished sensitivity to past consequences may influence relapse and treatment engagement. This work aims to fill a gap in literature and contribute to more effective, psychologically informed intervention strategies.

Josiah Pagel
Oregon State University

MENTORS Kathryn Holmes, M.D., M.P.H.

Impressions of accessibility and resource utilization of school age children with Marfan Syndrome

Marfan's syndrome has many adverse effects on the quality of life of affected children, however parents and schools' steps to help minimize these challenges and support their children are still largely unknown. Based on the current literature, children with Marfan's struggle in schools and based on their disabilities, have formal accommodations in place but are still presenting HRQOL (health related quality of life) scores behind their non-Marfan peers. This study aims to fill this knowledge gap in literature by determining the necessity of school accommodations and how frequently they are provided. We aim to better understand whether children with Marfan's are appropriately supported in educational settings and how necessary interventions can be implemented.

Qwyn Peterson
Portland State University

MENTORS Jeremy Copperman, Ph.D.

Learning the Language of Invasion: A Deep Learning Framework for Cell-Cell Interaction and ERK Signaling in Breast Cancer

To advance our understanding of early cancer progression, we aim to determine how the fate of tumor cells evolves over time and across microenvironmental states. In breast cancer, disease progression depends not only on cancer cells themselves, but also on how they interact with surrounding tissue. By dynamically capturing cellular communication and physical contact with resident cells in the host tissue, we aim to identify key features that drive invasion and progression. In particular, we are interested in what distinguishes the cells that ultimately invade beyond the mammary gland from those that remain contained.

Khadan Sangsasy
Portland State University

MENTORS Omar Kamal, M.D.

Retrospective Analysis of Mesenteric Incidental “Misty Mesentery”: Retrospective Evaluation of The Natural History of Mesenteric Panniculitis

Mesenteric panniculitis is an idiopathic, fibro-inflammatory condition which is sometimes encountered as an incidental finding on abdominal CT. It's etiology and clinical significance remains uncertain. While few studies have suggested increased risk of cancer, many other studies have found no significant association.This project aims to investigate the natural history and long term outcomes of mesenteric panniculitis.

Zoe Schuh
Portland State University

MENTORS Hannah Cory , Ph.D., M.P.H.

The Impact of Oregon's 2014 Medicaid Expansion on Low-Income Women

The impact on low-income women following Oregon's 2014 Medicaid expansion is explored through this student's narrative literature review. It has a specific focus on how the expansion impacted health outcomes as well as accessibility to reproductive and maternal care services.

Claire Sherman

Lewis and Clark College

MENTORS Joshua Saldivar, Ph.D.

Investigating the efficacy and efficiency of ATR Inhibitors, MDM2 Inhibitors, and Senolytics on Halting Cell Proliferation

A strategic approach to investigate different proteins involved in cell proliferation in cancerous cells. Cancerous cells typically harbor more DNA damage than normal cells. The Ataxia Telangiectasia and Rad3-related-protein (ATR) protein is a DNA damage response kinase that arrests the cell cycle allowing for DNA repair. Thus, the ATR protein is a key therapeutical target to hinder cancerous cell proliferation. Mouse Double Minute 2 Homolog (MDM2) and senolytics target the P53 pathway and senescent cells respectively, making them alternative therapeutic targets.

Paris Tilgner

Whitman College

MENTORS Lindsey Smith, Ph.D., M.P.P.

Understanding Health Services in Independent Living Communities

Independant living communities are utilized by hundreds of thousands of older adults in the United States, however, they remain absent from health services research because of limited regulations and lack of medical infrastructure. As aging populations increasingly rely on independant living settings to meet their needs, understanding how healthcare is accessed and coordinated in these settings is crucial. This study explores the perspective of independant living community directors across both HUD-assisted and market rate facilities in Oregon and Washington. The study aims to identify gaps, resource disparities, and areas for policy development in order to support residents aging and healthcare.

Isabella Villarreal-Elizondo

Seattle University

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

Understanding Patient Perception of GI psychological services as a tool for improving health outcomes

The field of Pediatric Gastroenterology is one that has been found to benefit from the incorporation of psychologist as members of the multidisciplinary care team, largely due to research showing a strong Gut-Brain connection that can have severe impacts on patient disorders. The field of GI psychology is, however, incredibly nebulous with its relative novelty as a specialty. Thus, a study was designed to analyze patient understanding and perception of psychological services. Understanding patient perception of these services is vital in order to ensure physicians have a framework to guide their introduction of this field and ensure they convey the multitude of benefits associated with the incorporation of psychological care in treatment of GI disorders.

Veronica Young
Portland Community College

MENTORS Adem Yildirim, Ph.D.

The Effects of Gas-Stabilizing Nanoparticles and High-Frequency Ultrasound on Melanoma Outcomes in vivo

GSNs and FUS have previously been applied in combination with chemotherapy by our team (Xiang et al. 2025), yielding complete responses in an immuno-compromised mouse model. Prior to advancing to translation, it will be crucial to understand synergy between tumor ablation and immunotherapy response. Tumor tissue collected from immunocompetent mouse models treated with GSN and FUS will be sectioned, fixed onto slides, stained using a variety of methods, and visually evaluated using a microscope to determine characteristics of the tumor environment. Hematoxylin and eosin (H&E) staining will show the (1) underlying structure of cells and tissues, while TUNEL staining will allow for imaging of cells undergoing apoptosis, (2) among other types of cell death, and a selection of fluorescent antibody staining will reveal the (3) quantities of immune cells present in the tissue. A key feature of this proposal includes tumors treated with a range of ultrasound intensities and with or without immunotherapy (i.e. tumors w/ different ultrasound intensities without immunotherapy; with immunotherapy; spontaneous melanoma tumor model) to evaluate preclinically efficacy of this new nano-platform.

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.

Madeleine Daly
University of Arizona

MENTORS Dustin Higashi, Justin Merritt, PhD

Investigating Potential Host Effectors in P. micra

Parvimonas micra (Pm) is an inflammatory pathobiont strongly associated with oral diseases, including periodontitis, infected root canals, and odontogenic abscesses. A critical theme uniting these diseases is the interplay between inflammatory immune responses and the overgrowth of inflammophilic (inflammation-loving) bacteria such as Pm. Preliminary data from our laboratory suggests that Pm may be a significant driver of this inflammation. To investigate this further, we employed a search algorithm to identify potential Pm candidate effector proteins that are hypothesized to manipulate host cellular processes. To study these candidate effectors and their role in infection, we: 1) Constructed Pm strains constitutively expressing hemagglutinin (HA)-tagged candidate effector proteins, allowing us to confirm protein expression and subcellular localization. 2) Generated Pm deletion mutant strains in the candidate effectors. These mutant strains are critical tools in the further study of Pm-host interactions and their role in inflammation and disease.

Sadie Drucker
Scripps College

MENTORS Matthew Barbisan, Jonathon Baker, PhD

Fatty acid synthesis and utilization impact virulence factors in Streptococcus mutans

Dental caries (tooth decay) is a prevalent disease that disproportionately affects individuals with limited access to oral healthcare and education. Streptococcus mutans, a key contributor to tooth decay, enhances its stress tolerance by modifying its cell membrane composition. The Baker Lab is interested in the regulation of this pathway and how S. mutans modifies its cell membrane, specifically by increasing the number of unsaturated fatty acids, a change that improves its virulence and competitiveness within microbial communities.
To explore this, several different mutant strains of S. mutans were used, each containing a unique genetic alteration in a gene involved in either the fatty acid synthesis pathway or the acquisition of exogenous fatty acids. Then, a competition assay was performed to evaluate each strain's ability to incorporate external fatty acids and thereby restore its competitive ability against Streptococcus sanguinis, a primary colonizer of tooth surfaces and natural competitor of S. mutans.

Micaela Grade
Western Washington University

MENTORS Cristiane Miranda Franca DDS, PhD

Investigating the spread and morphological change of PASC and PDAC cells through interactions with soft and stiff collagen

Pancreatic Adenosquamous Carcinoma (PASC) is a rare subtype of pancreatic cancer, with poor response to treatment and a worse prognosis than Pancreatic Ductal Adenocarcinoma (PDAC). Extracellular Matrices (ECMs), the networks of tissues and molecules surrounding cells, actively participate in PDAC progression. We hypothesize that ECM characteristics influence the aggressive behavior of PASC similarly to PDAC. To test this, PDAC & PASC primary cells derived from human metastatic tumors were formed into spheroids and seeded on top of collagen akin to healthy and fibrotic ECM. This allowed observation of the spread and morphological change of cancer cells in healthy and fibrotic tissue environments. Then, various ratios of PDAC/PASC co-cultures were tested, mimicking human tumors with mixed cell populations to assess influence of PASC cells on tumor aggression. We anticipate fibrotic collagen, with thicker fibers, will facilitate growth and invasion of PASC cells, and the presence of PASC cells in PDAC spheroids will increase overall collagen invasion.

Hannah Kim
University of Pennsylvania

MENTORS Ginny Hsu. MS, BDS

Identification of sex-dimorphism in temporomandibular joint-derived perivascular stromal cells (TMJ-PSCs)

Sex differences in temporal mandibular joint osteoarthritis (TMJOA) have long been an enigma. To investigate the underlying sex-specific mechanisms, we developed a burn synovectomy–induced TMJOA mouse model that reveals both morphological and molecular dimorphisms. Perivascular stromal cells (PSCs), known for their roles in angiogenesis and osteogenesis in bone diseases, may contribute to TMJOA pathogenesis. Transcriptomic and histological analyses identified sex-specific differences in PSC expression between male and female mice. Given that angiogenesis is a key indicator of inflammation, we employed optical coherence tomography (OCT) to visualize and quantify vascular changes in the TMJ synovial capsule. Unlike conventional histology, OCT enables high-resolution three-dimensional imaging of vascular structures in situ. TMJs were examined at baseline (uninjured), and at 4 and 8 weeks post-injury. Both two-dimensional cross-sectional images and three-dimensional OCT angiograms were analyzed to assess spatiotemporal changes in synovial vasculature associated with disease progression.

Michelle Lee
Oregon State University

MENTORS Matthew Barbisan, Jonathon Baker, PhD

Identifying Novel Lipid Metabolism Genes in Streptococcus mutans

In response to stress from acid or reactive oxygen species, Streptococcus mutans (a bacteria that causes cavities) increases the amount of unsaturated fatty acid in its cell membrane. This adaptation helps protect the cells and enhances their survival in harsh conditions. All Streptococcus species appear to make unsaturated fatty acids using an enzyme called FabM, but they can also acquire these fatty acids from the environment through use of a system called Fak (fatty acid kinase). When the fabM gene is deleted, the bacteria can no longer produce unsaturated fatty acids on their own and must rely on environmental sources, if available. Since many antibiotics target the bacterial cell envelope and S. mutans can modify their membrane composition to increase resistance, we are testing the antibiotic sensitivity of deletion mutants that are missing genes involved in fatty acid and lipid synthesis.

Yuna Lee
Emory University

MENTORS David Anderson, PhD, Justin Merritt, PhD

Decoding the RNase J Degradosome: Investigating Protein Interactions in Streptococcus mutans

Streptococcus mutans is a major contributor to dental caries, leading to billions of dollars in treatment costs every year. RNase J, an essential enzyme involved in RNA processing and gene regulation, assembles into a large multi-protein complex known as a degradosome via interactions with subsets of possibly 100 different proteins. This study aimed to better understand the architecture and function of the RNase J complex in S. mutans. Using molecular biology tools, ten candidate proteins suspected to interact with the RNase J degradosome were identified, many of which are hypothesized to have “moonlighting” functions—serving both its main function in the cell and specialized roles when paired with RNase J. To investigate these interactions, DNA constructs were designed to append FLAG, HA, or c-Myc epitopes to our target proteins to allow for co-immunoprecipitation assays. The ultimate goal of this research is to identity the breadth of heterogenous degradosome isotypes simultaneously present in S. mutans, as we suspect that there may be a correlation between protein complex constituents and RNA transcript targeting specificity.

Ayushi Mallick
University of California, Irvine

MENTORS Cristiane Miranda Franca DDS, PhD

Developing an R-based Spatial Analysis Pipeline To Detect Immune Hubs in Head and Neck Cancer

Head and neck cancer (HNC) claims 660k+ lives annually and is preceded by premalignant lesions. Not all lesions progress to cancer, and a translational approach is needed to predict this. Although immune cells influence tumor progression, the immune signature of both dormant and progressive lesions is unknown. A study using spatial transcriptomics in colorectal cancer samples found systems of immune cells (immune hubs) activated T-cells near tumors, which were attracted by myeloid cells. This assisted with predicting tumor progression. Another study showed immune hubs predicted lung cancer patient response to immunotherapy. My project aims to develop an R-based spatial analysis pipeline and an open-source database to detect immune hubs in HNC. We will determine if (1) HNC exhibits immune hubs and if (2) their gene signatures correlate with tumor malignancy by comparing invasive and metastatic cancer samples. We can then identify immune signatures tied to cancer progression or dormancy.

Emmanuel Sandoval
Portland State University

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

FInvestigating How EMVs from Streptococcus sanguinis Affect Immune Signaling in Salivary Gland Epithelial Cells

Streptococcus sanguinis is a commensal oral bacterium that helps prevent cavities by inhibiting harmful bacteria such as S. mutans. This response is mediated by the release of extracellular membrane vesicles (EMVs), tiny packages filled with proteins and genetic material. These EMVs interact with the body's cells and can affect immune signaling.
This project focuses on protein Stat1, which plays a key role in the interferon (IFN) signaling pathway—an important part of immune cell recruitment and activation/differentiation of T and B cells. Previous research shows that EMVs from S. sanguinis strain SK36 can inhibit this pathway in salivary gland epithelial cells (SGECs), but this effect is negated when a specific gene (SSA1882) is deleted. In this project, we will determine the effect of EMVs from S. sanguinis strain SK36, as well as ΔSSA1882 on levels of Stat1 and activated pStat1 in salivary gland epithelial cells. The results of our work will add further evidence of the roles of commensal bacteria in local oral health, with implications for adaptive immune signaling.

Anli Davis
Lewis and Clark College

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

Streptococcus sanguinis Extracellular Membrane Vesicles Inhibit Stat1 Production in Gingival Epithelial Cells

Streptococcus sanguinis, a gram-positive commensal bacterium that helps prevent caries by inhibiting cariogenic bacterial growth. This response is mediated by extracellular membrane vesicles (EMVs), packages filled with nucleic acid and proteomic cargo. EMVs interact with the body's cells and affect immune signaling. We focused on protein Stat1, which plays a key role in the interferon (IFN) signaling pathway—a vital part of immune cell recruitment and activation/differentiation of T and B cells. Previous work shows that EMVs from S. sanguinis can inhibit this pathway in salivary gland epithelial cells (SGECs). Here, we determine if a similar effect is seen in TIGK gingival epithelial cells. Specifically, if S. sanguinis EMV exposure, as well as other streptococci, have similar effects on pStat1 levels in TIGK Gingival Epithelial Cells. Our work will add further evidence of the role of commensal bacteria in local oral health, with implications for adaptive immune signaling.

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.

Kayla Allen
Pomona College

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

Evaluating Bispecific Antibody Responses Using HEK-293-CD20 Cells

CD3xCD20 bi-specific antibodies (BsAbs) are recently approved drugs that can treat patients with relapsed diffuse large-cell lymphoma and relapsed follicular lymphoma. However, this treatment has a median overall survival rate of only 9.2-18.5 months depending on the antibody. Previous unpublished studies done in this lab have shown that certain costimulatory proteins expressed on tumor B-cells likely stimulate BsAb activation. The goal of this project is to transfect CD20 into HEK-293T cells to create a model which can be used to test which costimulatory proteins increase BsAb activation.

Tania Chavez
Portland State University

MENTORS Melissa Wong, Ph.D., Nicole Giske

Proliferative states of Bmi1^{+} intestinal stem cells during adult homeostasis and injury-induced regeneration

The Wong Lab has shown that Bmi1^{+} intestinal stem cells (ISCs) are proliferative during development and become quiescent as the intestine reaches maturity. Preliminary data suggests that adult Bmi1^{+} ISCs enter a developmental state in response to epithelial damage. To investigate this phenotype, we analyzed Bmi1-Tdt lineage cells in irradiated murine intestines for proliferative and developmental status. Additionally, we isolated intestinal crypt cells from irradiated Bmi1-GFP mice and cultured them for organoid formation. Understanding the mechanisms that drive Bmi1^{+} ISC proliferation in the adult intestine may offer insights into epithelial repair during diseases such as colorectal cancer.

Nathan Mebratu
University of Washington

MENTORS Cristiane Miranda Franca, D.D.S., Ph.D., Melissa Wong, Ph.D., Pragyan Paramita, Ph.D., Abigail Moore, Pinaaz Hode

Exploring how the ECM's mechanical properties affect hybrid cell generation and heterogeneity

Understanding how the extracellular matrix (ECM) contributes to tumor progression is essential for studying the tumor microenvironment. The ECM provides structural support and regulates cellular behavior through its mechanical properties. Increased stiffness is a hallmark of many tumors and is linked to enhanced proliferation and invasion. A key ECM component is collagen, and can be altered to study these effects. However, the role of ECM stiffness in hybrid cell behavior is not fully understood. Hybrid cells are formed from the fusion of macrophages and cancer cells, and play a key role in metastasis. This project will co-culture MC38 cancer cells with murine macrophages on soft and stiff collagen to generate hybrid cells and assess how stiffness influences their formation. Additionally, pre-formed hybrid cells will be cultured on varying collagen stiffness to evaluate their proliferation in different mechanical environments.

Trinity Robinson
Lousiana State University

MENTORS Nabil Alkayed, M.D., Ph.D., Catherine Davis, Ph.D., Thierno Madjou Bah, Ph.D.

The effect of GPR39 on Microglial Activation in in-vitro models of neurological disease.

Neurological disorders such as traumatic brain injury, Alzheimer's disease, vascular dementia, and stroke are all closely associated with neuroinflammation. HMC3, a microglial immune cell, activates from these inflammatory stimuli producing a positive feedback response, causing decline in cognitive function and neurodegeneration. GPR39, a G-protein coupled receptor, has been identified as a potential regulator of this inflammatory signaling. The stimulation of GPR39 produces 14,15-epoxyeicosatrienoic acid (14,15-EET), a vasoactive and anti-inflammatory metabolite of arachidonic acid. Thus, combating the inflammatory cytokine IL-6, produced from lipopolysaccharide (LPS) and Hemin.

Cariam Rodriguez Santiago
Colby College

MENTORS Sarah Andres, Ph.D., Kevin Swift, Ph.D.

The role of Imp1 in intestinal epithelial cell differentiation in a mouse model of necrotizing enterocolitis

Necrotizing enterocolitis (NEC) is a gastrointestinal disease that affects premature infants. NEC results from the inflammation and necrosis of the intestinal epithelium, a tissue maintained by intestinal epithelial stem cells (IESCs). IESCs differentiate into absorptive and secretory cells, which perform the functions of the intestinal epithelium. Our findings suggest that RNA-binding protein Imp1 may influence differentiation toward a secretory cell phenotype. We used immunofluorescent staining to test the hypothesis that Imp1 alters IEC differentiation, increasing susceptibility to inflammatory damage. Results suggest that Imp1 overexpression (Imp1OE) promotes transcription factor Cdx2 expression during homeostasis and increases damage susceptibility. Moreover, Imp1OE mice show attenuated secretory cell expansion in response to damage relative to controls. This study will delineate NEC susceptibility and pathogenesis, which will contribute to the development of therapies.


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