DEPARTMENT OF INTERNAL MEDICINE
COLLEGE OF MEDICINE

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2026

PROJECT TITLE: Creating the first racially diverse, spatial genome atlas of pancreatic cancer

Nina Steele, PhD (bertauna@ucmail.uc.edu)
Assistant Professor
Division of Gastroenterology and Hepatology
Department of Internal Medicine
College of Medicine
University of Cincinnati

Project Description

Steele lab Project Description
Pancreatic Ductal Adenocarcinoma (PDAC) is one of the deadliest forms of cancer, yet our understanding of it is fundamentally biased. Currently, the vast majority of biomedical data comes from White patients, leaving a critical blind spot in how we understand and treat Black/African American (BAA) patients, who statistically face higher mortality rates. This project aims to dismantle that disparity by creating the first racially diverse, spatial genome atlas of pancreatic cancer. Traditional genomic sequencing blends a tumor into a "smoothie" to analyze its DNA, losing critical information about how cells interact. We are taking a different approach. Using cutting-edge Spatial Transcriptomics (ST) and single-cell RNA sequencing (scRNAseq), we will map gene expression while preserving the architectural context of the tissue. In this project we are analyzing surgical samples from patients, including BAA patients. By correlating this "tumor map" with clinical data like survival rates and treatment history, we can identify specific molecular differences driving racial disparities. Cancer is not static; it evolves to escape the immune system. Another aspect of our project utilizes an incredibly rare dataset: matched samples from the same patients collected at three critical time points—diagnosis (biopsy), surgery, and metastasis (spread to other organs). By comparing these samples, we will track "immune exhaustion"—the process where the body’s defense system gets tired and stops fighting the cancer. This allows us to see how the tumor microenvironment changes over years, specifically focusing on how immune cells and fibroblasts (structural cells) facilitate cancer spread. This research will generate a transformative resource for the entire cancer community, filling a massive gap in biomedical data. By understanding the biological mechanisms behind racial disparities, we pave the way for more equitable, personalized treatments. This is an opportunity to use high-

performance bioinformatics and genomic technology to solve a pressing real-world problem in health equity.
(No IRB or IACUC needed for this, samples fully de-identified, this is covered under a non human subjects research protocol, Steele, 2025-0208)