Dean's Colloquium
Dr. Mengistu Shukare
Assistant Professor Department of Chemistry and Biochemistry

When: Wednesday, Feb 26th, 2025
Where: Turner 129
Time: 2:30 – 2:50 pm, Q&A: 5 Min
Title: Mitochondrial Dynamics in Cancer Progression and Therapy Resistance

Mitochondrial Dynamics in Cancer Progression and Therapy Resistance

Cancer remains a leading cause of mortality worldwide, with tumor aggressiveness and therapy resistance presenting significant clinical challenges. Mitochondria, as central regulators of cellular metabolism, play a crucial role in cancer cell survival, proliferation, and adaptation under metabolic and therapeutic stress. Beyond intrinsic metabolic remodeling, cancer cells actively acquire mitochondria from stromal cells. This intercellular exchange enhances cancer cell metabolic plasticity, promoting stemness, immune evasion, and resistance to conventional treatments.

A key unanswered question is how cancer cells dynamically switch between glycolysis and oxidative phosphorylation (OXPHOS) to sustain survival and therapy resistance. This metabolic flexibility is particularly critical for cancer stem cells (CSCs), which rely on mitochondrial function for self-renewal, metastasis, and therapy resistance. We hypothesize that CSCs acquire mitochondria from surrounding stromal cells, conferring metabolic advantages that enhance their tumor-initiating potential and adaptability. However, the mechanisms regulating this process remain poorly understood.

This study investigates mitochondrial function in cancer progression and resistance by assessing mitochondrial respiration, ATP production, ROS dynamics, and intercellular mitochondrial transfer within the tumor microenvironment. Using a multi-omics approach (transcriptomics, proteomics, and metabolomics), we aim to identify key metabolic vulnerabilities and regulatory pathways driving mitochondrial acquisition in aggressive tumors. Understanding how mitochondrial reprogramming fuels cancer adaptation could lead to the development of novel therapeutic strategies that target metabolic dependencies and disrupt tumor-stroma interactions, ultimately improving treatment efficacy.

Biography: Dr. Mengistu L. Shukare is an Assistant Professor of Chemistry and Biochemistry at Hampton University, with a Ph.D. in Biomedical Science from Shiga University of Medical Science, Japan. He has over five years of research experience in metabolic diseases and cancer as a Staff Scientist at the City of Hope National Cancer Center in California. His research focuses on interorgan communication, mitochondrial dynamics, and metabolic reprogramming in cancer progression, aiming to elucidate the molecular mechanisms underlying tumor adaptation and therapy resistance.