

UCSD NANOENGINEERING/CHEMICAL ENGINEERING
SEMINAR SERIES

Wednesday, May 17th, 2023

Seminar Presentation: 11:00am - 12:00pm

SME room 248*“Advanced Technologies for Diagnosis, Monitoring, and Understanding of Diseases”***Dr. Mahla Poudineh, PhD***Assistant Professor
University of Waterloo*

Abstract: Detection of molecular analytes and biomarkers for disease diagnosis and physiological monitoring requires new technologies to interrogate different body fluids such as whole blood and interstitial fluid (ISF). These technologies should be highly sensitive, specific, and able to continuously analyze biomarkers in real-time. Molecular probes, material chemistry, and polymer engineering, as well as nanotechnology and micro/nanofabrication, are crucial tools to generate such technologies.

At IDEATION Lab, we employ Microneedles and Microfluidics as the main technologies to develop innovative engineering solutions that advance disease diagnosis and monitoring and explore the fundamental aspects of disease manifestation. In the first part of my talk, I will present our new transdermal biosensing technologies powered by engineered hydrogel microneedles (HMNs), nucleic acid probes, and in-situ metallic nanoparticle synthesis for minimally invasive, on-needle, and real-time measurement of clinically important biomarkers in ISF. Our HMN assays expect to pave the way for the next-generation of flexible, polymeric-based wearable biosensors. In the second part, I will discuss a universal real-time biosensor driven by microfluidic techniques that continuously measures specific biomolecules' fluctuating concentration levels with picomolar sensitivity directly in whole blood. For the first time, our microfluidic assay enables measuring the dynamic changes in blood insulin and glucagon, two hormones that balance the glucose levels. Understanding the kinetics of diabetes-related hormones can provide valuable information about hormonal links between obesity, prediabetes, and progression to type 2 diabetes.

The new advances reported in this talk, enrich the level of information that can be collected from different body fluids, and offer new detection systems applicable to the diagnosis and monitoring of a variety of disease states. As a result, these advancements have the potential to revolutionize the way patient health is managed.

Biosketch: Mahla Poudineh is an Assistant Professor at the University of Waterloo, Department of Electrical and Computer Engineering and the founding director of IDEATION Lab (Integrated Devices for Early disease Awareness and Translational applicatIOns Laboratory) since January 2020. She received her Ph.D. degree in Electrical Engineering from the University of Toronto in 2016. Prior to joining Waterloo, Mahla completed postdoctoral training at the University of Toronto, and Stanford University, School of Medicine in 2018 and 2019, respectively. Her research interests include developing biosensing approaches for diagnostic and therapeutic purposes, continuous health monitoring and translating biomedical devices to the clinic and market. Her research has been selected as Science Translational Medicine Editor's choice article and highlighted in the Nature News&Views. She was the recipient of Waterloo, ECE Department Research Excellence Award in 2022. She has been also selected as an Inaugural Contributor to the Advanced Healthcare Materials “Rising Stars” Series and to the Nanoscale Emerging Investigators Themed Collection.