UC Irvine Samueli
Department of Chemical and Biomolecular Engineering

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ISEB 1200
11:00a – 12:00p

Conductive and Tough Bioadhesive Hydrogel for Tissue Engineering and Biosensing

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Abstract: Hydrogels have been extensively used for various biomedical applications, ranging from tissue engineering to matrices for drug delivery, as well as substrates for biosensing, due to their versatility in structure and physical properties. Although significant progress has been made towards designing hydrogels with tunable properties, engineering tough and elastic hydrogels that resemble native tissue mechano-physical properties is still considered a great challenge. In addition, for many tissue engineering applications as well as biosensing, the conductivity of hydrogels is an important factor. Many attempts have been made to engineer conductive hydrogels through the incorporation of external conductive fillers such as carbon nanotubes, graphene, MXenes, metallic micro/nanoparticles, and intrinsically conductive polymers such as polyaniline and polypyrrole. However, the engineered conductive composites require a high concentration of conductive fillers, leading to inconsistent dispersion and agglomeration, as well as toxicity, limiting their biomedical applications. To address these limitations, our lab has focused on engineering multifunctional naturally-derived hydrogels with combined properties of high toughness, flexibility, adhesion, high elasticity, and conductivity through tuning various molecular interactions among the building blocks of the hydrogel network. In addition, the use of natural polymers as the backbone endows the engineered hydrogels with improved biocompatibility and biodegradability, which have been extensively tested in various in vitro and in vivo models. Due to the tunability of the physio-chemical properties of the engineered hydrogel networks, we have applied them for various applications ranging from tough and ultra-strong tissue adhesives for surgical applications to highly stretchable and conductive flexible sensors for real-time human health monitoring. In this presentation, I will outline our recent works on the design of tough bioadhesive hydrogels for soft tissue sealing and regeneration as well as their application as wearable biosensors.

Bio: Dr. Nasim Annabi is an Associate Professor in the Department of Chemical and Biomolecular Engineering at the University of California, Los Angeles (UCLA). Her team has pioneered engineering innovative multifunctional biomaterials with tunable properties for tissue regeneration and ultra-strong bioadhesives. Dr Annabi has published over 170 peer-reviewed articles, with an H-index of 85 and over 28000 citations. Her innovations have resulted in 17 issued patents and five invention disclosures, attracting significant commercial interest. Recently, she named a Senior Member of the National Academy of Inventors (NAI) due to her remarkable achievements as an academic inventor and a rising leader in the field as well as her success in patents, licensing and commercialization.

Dr. Annabi has been recognized as one of the world's most influential researchers in her field by Clarivate in 2022, 2023, and 2024. Furthermore, her work has garnered recognition through several prestigious awards, including the 2021 Biomaterials Science Lectureship Award from the Royal Society of Chemistry (RSC), the 2021 Young Investigator Award from the Society for Biomaterials (SFB), and the 2020 Nanoscale Science and

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Engineering Forum (NSEF) Young Investigator Award from the American Institute of Chemical Engineers (AIChE) among several other notable honors.

As a recognized expert in the field, Dr. Annabi currently serves as an Associate Editor for the journals of Biomaterials Science, and Bioengineering in Frontiers in Transplantation, and she is on the Editorial Board for Tissue Engineering: Part B. Additionally, she serves on the Executive Advisory Board of Advanced Nanobiomed Research and Trends in Biotechnology.

Hosted by: *Prof. Herdeline Ardoña*