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NanoEngineering

UC SAN DIEGO NANOENGINEERING SEMINAR

Wednesday, April 10th, 2019 Seminar
Presentation: 11:00am – 12:00pm
SME 248

"Molecular Engineering of Biologically-Inspired Materials"

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Abstract: New materials that can be programmed to elicit biological responses have enormous potential in therapeutic applications. Our research group uses a biomimetic approach to design such materials. We apply tools of genetic engineering to produce nanostructured, protein-based materials that cannot be fabricated using conventional chemical synthesis. By redesigning architecture and self-assembly behavior at the molecular and nanoscale levels, one can customize these biomaterials to yield novel properties and biological interactions. One example is a highly-stable, 25-nm protein nanoparticle with a hollow cavity. We have demonstrated that this nanoparticle can be engineered to accommodate drug molecules, exhibit pH-triggered assembly and drug release, and target cancer cells. Furthermore, viral-mimetic cancer vaccines designed from these nanoparticles yield a significant increase of survival time in tumor-challenge studies. In another example of a biomimetic scaffold, we have developed a platform to fabricate a new class of polymers that had previously been elusive to create. These biopolymers are based on the extracellular matrix protein collagen, and we demonstrate that the responses of cells residing on these materials can be tuned by altering specific chemical and biological sites within the polymers. Current investigations focus on the immunosuppressive effects of a domain that interacts with a leukocyte-associated Ig-like receptor (LAIR-1), an inhibitory receptor expressed on many different types of immune cells. Our studies collectively reveal the tremendous potential of using natural protein scaffolds as a departure point for creating novel classes of biomaterials.

Biosketch: Dr. Szu Wang received a B.S. in Chemical Engineering from the University of Illinois, Urbana-Champaign, and M.S. and Ph.D. degrees in Chemical Engineering at Stanford University, during which she was a Whitaker Foundation Graduate Fellow. After graduation, she held research scientist positions at The Liposome Company (Elan Pharmaceuticals) and TransForm Pharmaceuticals, companies that specialized in drug delivery and formulations. Dr. Wang is now a Professor in the Department of Chemical and Biomolecular Engineering at the University of California, Irvine. Her research group designs and investigates biomimetic materials, molecular delivery, and protein self-assembly for applications in therapeutics and tissue engineering. She has received a Faculty of the Year teaching award and a Mid-Career Faculty Excellence in Research Award from the School of Engineering at UC Irvine. Her research has been supported by agencies such as the NSF, NIH, and DoD.