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Protein Assembly to Create Therapeutic Materials

Protein drugs can provide a key advantage over small molecule drugs; they evolved to perform their function, while small molecules are often selected for “best” function compared to a pool of candidates. However, proteins can present challenges in delivery that must be overcome in order to be used as therapeutic drugs. Their folded structure is critical to their biological function, but makes them sensitive and difficult to package. This structure also provides an opportunity to create materials from proteins that is not available for small molecules. The main goal of our work is to engineer materials made directly from therapeutic proteins. This is accomplished through a combination of self-assembly and/or bio-conjugation processes. The ability to control these processes is essential to manipulating material physical properties, ensuring retention of protein activity, and directing the interactions between the materials and cells. The strategies developed here provide opportunities to work with unlikely proteins, such as those from pathogenic bacteria, and transform them from disease causing agents into beneficial therapeutic materials. Protein design, self-assembly and disassembly properties, and applications of therapeutic protein materials in immunomodulation and cancer will be discussed.

Julie Champion is an Associate Professor in the School of Chemical & Biomolecular Engineering at Georgia Institute of Technology and a member of the Institute for Bioengineering and Biosciences and the Bioengineering Program. She earned her B.S.E. in Chemical Engineering from the University of Michigan in 2001. Dr. Champion completed her Ph.D. in Chemical Engineering at the University of California Santa Barbara in 2007 as a National Science Foundation graduate fellow under the advisement of Dr. Samir Mitragotri. She was a National Institutes of Health postdoctoral fellow from 2007-2009 at the California Institute of Technology in the lab of Dr. David Tirrell. Professor Champion’s current research focuses on design and self-assembly of therapeutic nanomaterials made from engineered proteins for applications in immunology and cancer. Dr. Champion has received a BRIGE award from the National Science Foundation, the Georgia Tech Women in Engineering Faculty Award for Excellence in Teaching, and the Georgia Tech BioEngineering Program Outstanding Advisor Award.

The Chemical Engineering Graduate Seminar Series events are part of the required curriculum for chemical engineering graduate students, but open to all Iowa State University graduate students, post-doctoral researchers, scientists, faculty and staff. See the full seminar schedule at cbe.iastate.edu/seminar-series/

Thursday,

October 4, 2018

11:00 a.m.

171 Durham Center

Iowa State University