Preparer: Dr. Devin Ridgley  
Bioengineering Post Doctoral Fellow

Title: Engineering Large Amyloid Fibers

Abstract: Functional amyloids found throughout nature have demonstrated that amyloid fibers are potential industrial biomaterials. This work introduces a new “template plus adder” cooperative mechanism for the spontaneous self-assembly of micrometer sized amyloid fibers. A short hydrophobic template peptide induces a conformation change within a highly α-helical adder protein to form β-sheets that continue to assemble into micrometer sized amyloid fibers. This study utilizes a variety of proteins that have template or adder characteristics which suggests that this mechanism may be employed throughout nature. Depending on the amino acid composition of the proteins used the mixtures form amyloid fibers of a cylindrical (~10 µm diameter, ~2 GPa Young’s modulus) or tape (5-10 µm height, 10-20 µm width and 100-200 MPa Young’s modulus) morphology. Processing conditions are altered to manipulate the morphology and structural characteristics of the fibers. Spectroscopy is utilized to identify certain amino acid groups that contribute to the self-assembly process. Atomic force microscopy (AFM) is utilized to delineate the self-assembly of amyloid tapes and cylindrical fibers from protofibrils (15-30 nm width) to fibers (10-20 µm width) spanning three orders of magnitude. The goal of this research is to produce, manipulate and characterize the self-assembly of large amyloid fibers for their potential industrial biomaterial applications. Furthermore, the mechanisms described here may offer some insight into naturally occurring amyloid forming systems.

Biographical: Dr. Devin Ridgley received his Bachelors’ degree in Biological Engineering from the University of Missouri (2010) and his Ph.D. in Biological Systems Engineering from Virginia Tech (2014) working for Dr. Justin Barone. His doctorate research focused on characterizing and engineering amyloid fibers, a naturally occurring proteinaceous biomaterial. Since August (2014), he has been a post-doctoral fellow in Dr. James Lee’s research group in the Department of Biological Engineering at the University of Missouri. He is currently tasked with delineating the mechanism by which amyloid-β causes cytotoxic effects within microglial and endothelial cells in Alzheimer’s disease.

Date • Time • Location: Tuesday, 9-16-2014, 4:00 PM, 105 Agricultural Engineering Building