Dustin Britton

New York University Chemical and Biomolecular Engineering Department

Title: Computationally guided coiled-coil hydrogel for exosome delivery in diabetic wound healing

Abstract: Protein hydrogels represent an important and growing biomaterial for drug delivery. We have previously explored the ability to engineer thermoresponsive supramolecular assembling coiled-coil proteins, Q and Q2, into hydrogels with varying gelation properties. We computationally design a coiled-coil hydrogel, Q5, with enhanced upper critical solution temperature (UCST) behavior and faster gelation kinetics for improved drug delivery. We explore the drug delivery ability of Q5 via encapsulation of exosomes for sustained delivery for diabetic wound healing applications. We fully characterize the helical coiled-coil Q5 hydrogel for its structure, nano-assembly, and rheology compared to Q to investigate differences in coiled-coil design for exosome delivery. Q5 exhibits a decrease in fiber diameter coupled with an increase in crosslinking density and storage modulus which is maintained upon exosome encapsulation. We also note increased gelation rate upon encapsulation in the Q5 protein solution suggesting improved hydrogel stability. Functional differences in Q and Q5 lead to important answers towards specific sequence design parameters for targeting improved drug delivery.