ACS Local Section
North Jersey

Elucidating Spider Silk Structure and Assembly with NMR

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Date: **February 23rd, 2023**

Time: 12:00 pm ET via Microsoft Teams

Abstract

Over 300 million years spiders have evolved to produce six different silks and one glue-like substance. Spider silks are comprised almost entirely of protein and are used for a diverse range of applications including web construction, egg case production and wrapping prey. The silks vary dramatically in their mechanical and physical properties with the major ampullate silk (dragline) exhibiting a strength that exceeds steel by weight and a toughness greater than Kevlar while, flagelliform silk has an elasticity comparable to rubber. Our lab is focused on understanding the molecular structure and dynamics of the proteins that comprise the various spider silk fibers with MAS solid-state NMR. It is the folded structures and hierarchical organization of these proteins that imparts spider silks their impressive yet diverse mechanical and physical properties. Our research team has been developing and applying SSNMR to probe secondary structure, hydrogen-bonding, side chain dynamics, and oligomeric protein assembly all of which are crucial to understanding spider silk formation and the resulting fiber properties. Recently, we have focused on using solution NMR to understand the protein-rich fluid within the various silk producing glands to investigate the conformational structure and dynamics prior to fiber formation and determine the important biochemical triggers responsible for converting this hydrogel-like protein solution to fibers with unparalleled, yet diverse mechanical properties. It is our belief that a better fundamental understanding of spider silk protein structure and assembly process will accelerate the ability to mimic and reproduce similar biologically inspired materials in the lab.

Connection Information

This will be a virtual meeting hosted via Microsoft Teams. A direct link to the meeting is located HERE.

Further information can be found on the NMR Topical Group website.

Please reach out to Tom Osborn Popp (thomas.osbornpopp@rutgers.edu) or Christine Jorge (christine.jorge@bms.com) with any questions.

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