NORTHWESTERN UNIVERSITY'S DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING AND MATERIALS RESEARCH SCIENCE AND ENGINEERING CENTER PRESENT:

2022 MSE FUTURE LEADERS SEMINAR SERIES

Monica Ohnsorg

Postdoctoral Researcher, University of Colorado Boulder

Monica is currently a postdoctoral researcher in Professor Kristi Anseth's group in the Chemical and Biological Engineering Department at the University of Colorado Boulder. In the Anseth lab, she is investigating novel biomaterials to understand cell-matrix interactions in super-soft networks. She received her PhD from the University of Minnesota-Twin Cities in 2021 where she was a NSF Graduate Research Fellow in the Department of Chemistry co-advised by Professors Theresa Reineke and Frank Bates. Her research, focused on using bottlebrush copolymers to increase the solubility of small molecule pharmaceuticals for oral drug delivery, was awarded the Eastman Chemical Student Award in Applied Polymer Science. In 2016, she received her B.S. in Chemistry from Hope College. There, as a Beckman Scholar, she researched metal-organic framework thin films in the lab of Professor Mary E. Anderson and was awarded the 2016 ACS Undergraduate Award in Inorganic Chemistry. Outside of lab, Monica enjoys painting, photography, skiing, and hiking in the Rocky Mountains.

Bottlebrush Copolymer Excipients to Non-Covalently Sequester and Solubilize Active Pharmaceutical Ingredients

Bottlebrush polymers have great potential as vehicles to non-covalently sequester, stabilize, and deliver hydrophobic small molecule active pharmaceutical ingredients. To this end, we synthesized a poly(N-isopropylacrylamide-stat-N,N-dimethylacrylamide) bottlebrush copolymer using reversible addition-fragmentation chain-transfer polymerization followed by ring-opening metathesis polymerization. Post-polymerization end-group modification was then used to control the thermoresponsive properties of the bottlebrush copolymer in solution. Solubility enhancement of the anti-seizure medication, phenytoin, increased with the hydrophilicity of the end-group moiety. Notably, carboxylic acid functionalized bottlebrush copolymers outperformed linear copolymer controls at higher drug loadings because they existed as unimolecular nanoparticles that were more stable in solution. In addition, the top-performing bottlebrush copolymer excipients were used to solubilize an orally administered breast cancer therapeutic, GDC-0810, with which we visualized how the drug-polymer nanostructures formed during dissolution are distinct between linear and bottlebrush copolymer excipients using cryogenic transmission electron microscopy. These insights could allow us to better interpret how the formation of liquid-liquid phase separated nanodroplets versus amorphous drug-polymer nanoparticles impacts the bioavailability of small molecule actives. This work provided the first investigation of bottlebrush copolymers for the hydrophobic non-covalent sequestration and solubilization of small molecule pharmaceuticals.

Wednesday, May 18 • 10 AM CDT • Zoom Link

Meeting ID: 958 6172 3631 • Password: mse_FLS

Questions? Contact Elena.Lindstrom@northwestern.edu

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