Control over primary sequence and structure is critical to the development of new functional materials such as catalysts, synthetic affinity ligands and therapeutics, sequence responsive scaffolds, programmable biomaterials and much more. Motivated by these opportunities and the need for sequence-control and structural diversity in polymer research, we present a versatile methodology for the assembly of a new class of sequence-defined macromolecules called oligoTEAs. With sequence-control in hand, we are currently working to establish sensitive solution-phase structural characterization methods to determine their conformational dynamics and to formulate sequence-structure relationships for biological applications. We focus on applications that leverage the advantages of these novel macromolecules such as increased serum stability, precise control of backbone and pendant group sequence, and a large scope of chemically diverse monomers.

Current applications under exploration in our lab include the design of cleavable linkers to quantitate intracellular cleavage kinetics, development of novel sequences and conjugates for intracellular drug delivery, and the design of membrane selective antibacterial compounds. In this talk, I will discuss the antibacterial properties of oligoTEAs in detail by examining the kinetic phenomenon behind their mechanism of action and investigations into the effect of primary sequence, composition and structure on antibacterial properties.