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Novel Antimicrobial Materials

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Many peptides, such as the Magainins and Defensins, are amphiphilic in nature and known to fold into specific conformations responsible for their antimicrobial membrane activity. Recently, facially amphiphilic peptides built from β-amino acids have been shown to mimic both the structures as well as the biological function of natural antimicrobial peptides. The design of simple polymers and oligomers that mimic the complex structures and remarkable biological properties of proteins is an important endeavor and would provide attractive alternatives to the difficult synthesis of natural peptides. We have designed a series of facially amphiphilic molecules that capture the essential physical and biological properties of antimicrobial peptides, but are easy to prepare from inexpensive monomers. They have potent activity (single micromolar) and are active against a broad spectrum of bacteria including gram-positive and gram-negative as well as antibiotic resistant strains. They act directly on the phospholipid membrane so that molecule-membrane interacts are critically important to understand. We will discuss our recent insight on this topic including calorimetry, SAXS, and vesicle leakage data.