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# Molecular changes to achieve supramolecular control of peptidic nanostructures.

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Understanding and controlling the behavior of supramolecular nanostructures can impact medicine, pharmacy, and biotechnology. In this talk, I will describe a series of peptide amphiphiles (PA) with tunable properties and responsive behavior. PAs are amphiphilic molecules that self-assemble in water forming nanostructures of diverse shapes and sizes. We have studied the effect that diverse hydrogen-bonding groups such as urea have on the properties of supramolecular assemblies. We also studied the interplay between the urea motif and different amino acid side chains and the effect on the nanostructures' morphology. Also, we prepared a novel set of PAs containing bioisosteres of carboxylic acid. Bioisosteres are functionalities that share one or more physical, chemical, or structural properties with another chemical group. Using transmission electron microscopy, atomic force microscopy, and small-angle X-ray scattering (SAXS) we investigated the shape and size of the new PAs. We studied the internal arrangement of the assemblies using circular dichroism (CD). In addition, we assessed the changes the nanostructures experiment in response to fluctuations in the external environment (i.e. heat and pH). We also examine the relative stabilities of the assemblies using variable temperature (VT)-CD and VT-SAXS. We have found the urea groups have a dramatic effect on the shape and stability of the nanostructures. Meanwhile, the bioisosteric PAs were sensitive to pH changes. This work demonstrates that small molecular changes can lead to nanostructures that maintain or change shape based on external forces. This knowledge can be applied to the design of nanocarriers, nanodrugs, or nanoplatforms for cell grow and tissue engineering.