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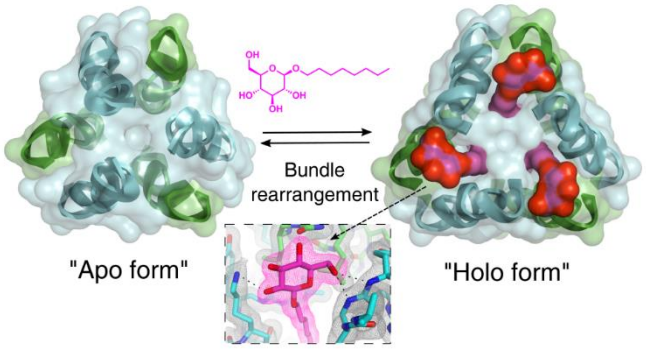
Aqueous Self-assembly of Oligourea Helices : Toward in vitro Unnatural Protein Synthesis

Peptides (e.g. insulin) play pivotal roles in living organisms. Various peptidomimetics have shown structures and functions that have not been found in natural peptides. One of the important progress in peptidomimetics would be their pharmaceutical usages. In light of the promising applications of peptidomimetics, proteomimetics which can serve roles of proteins would become a valuable class of synthetic molecules for the development of novel drugs, catalysts and etc.

Here, self-assembly of amphipathic water-soluble oligourea helices for the creation of proteomimetics with non-natural shapes and functions is introduced. First, we present adaptive binding mode whereby the oligourea helix bundle undergoes substantial conformational change to accommodate guest molecules in a manner reminiscent of glycolipid transfer proteins. Secondly, environment-dependant expansion of water-filled oligourea helix channel reminiscent of membrane proteins is presented. Lastly, functionalization of oligourea helix channel with cationic pore is presented. The dynamic nature and functionalization of the self-assembling oligourea helices reported here marks a step forward in the design of functional proteomimetic molecular assemblies.



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