Amphipols: from design to applications in membrane biochemistry

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Membrane proteins fulfill essential functions for cell survival. Investigating their structure and activity generally requires the used of detergents for solubilization and purification steps. However, detergents often lead to membrane protein inactivation. This has prompted the search for new amphiphilic environments, among which amphipathic polymers called 'amphipols' (APols) have been developed.

APols have proven to provide an interesting environment for stabilizing membrane proteins in aqueous solution (1). They are compatible with most biochemical and biophysical techniques, notably with cryo-electron microscopy by improving particle distribution. The most studied and used APol, A8-35, is composed of a polyacrylate backbone grafted with octylamine and isopropylamine side chains. The extensive characterization of A8-35 has revealed some limitations such as a reduced solubilizing power of membranes compared to detergents, and a solubility sensitive both to the presence of calcium ions and to lowering the pH of the solution below neutrality. These limitations have led to the development of polymers with different chemical structures. In the other hand, a library of A8-35 derivatives has been created, expanding the scope of APol applications in both basic and applied research. During this seminar, we will see the extraordinary versatility of APols for membrane protein studies and the design of new polymers for going beyond some limitations.

(1) Zoonens & Popot, Amphipols for each season (2014) *J. Membrane Biol.* **247**:759-796