ATP Synthesis in Giant Unilamellar Vesicles Formed by Double-Emulsion Microfluidics

O. M. Eggenberger[1], R. Cochereau[1], P. Müller[2], J. Coats[1], R. P. Wehr[1], C. von Ballmoos[2]*, C. G. Palivan[1]*

[1]Physical Chemistry, University of Basel, [2]Chemistry, Biochemistry and Pharmaceutical Sciences, University of Bern

The cellular membrane is a key component of a cell, used to maintain homeostasis by blocking toxic materials from entering the cell while allowing the flow of necessary molecules through incorporated channels, receptors, and transporters. Further understanding of the complex composition of the cell membrane, especially how membrane proteins function in conjunction with others, is possible through the formation of a cell membrane mimic. To this end, we present the formation of giant unilamellar polymer vesicles through double-emulsion microfluidics. These vesicles are then functionalized with NapA, a sodium-proton antiporter, and ATP synthase, the enzyme that phosphorylates ADP to form ATP, the energy currency of the cell. Establishing a system where any set of membrane proteins with coupled functions can be investigated in detail allows us to increase our understanding of how the many components of cellular membrane influence each other.

