POLYOXOMETALATES AS TRANSMEMBRANE CARRIERS

Gumerova N. I., Rompel A.
Universität Wien, Fakultät für Chemie, Institut für Biophysikalische Chemie,
Josef-Holaubek-Platz 2, 1090 Wien, Austria, https://www.bpc.univie.ac.at
nadiia.gumerova@univie.ac.at

The investigation of ion effects on biological systems, pioneered by Hofmeister, has evolved from the classical Hofmeister scale to encompass direct interactions between chaotropic ions and dissolved organic matter, known as the "chaotropic effect." Recently, inorganic cluster anions, particularly polyoxometalates (POMs), have garnered attention for their superchaotropic behavior, surpassing traditional chaotropic ions. Exploiting this property, we explore the potential of selected all-inorganic Keggin POM anions as membrane carriers under neutral physiological conditions in both model membranes and living cells (Fig. 1). These carriers surpass established molecular carriers, facilitating the transportation of arginine-rich and lysine-rich oligo- and polypeptides. These findings advocate for further refinement of POM carriers, heralding a transformative understanding and utilization of the biological functionality of these adaptable compounds.

The study systematically evaluates eight POMs, encompassing representatives from globular Keggin and planar Anderson archetypes, with charge statuses ranging from –3 to –8. The relationship between their stability and speciation is meticulously scrutinized. To address hydrolysis concerns, highly charged mixed-metal derivatives are included, demonstrating stability at neutral pH levels. Crucially, the investigations into stability and speciation play a pivotal role in deciphering the nuanced behavior of POMs in aqueous solutions. Specifically, the correlation between stability and speciation informs the selection of compounds for subsequent biological applications.

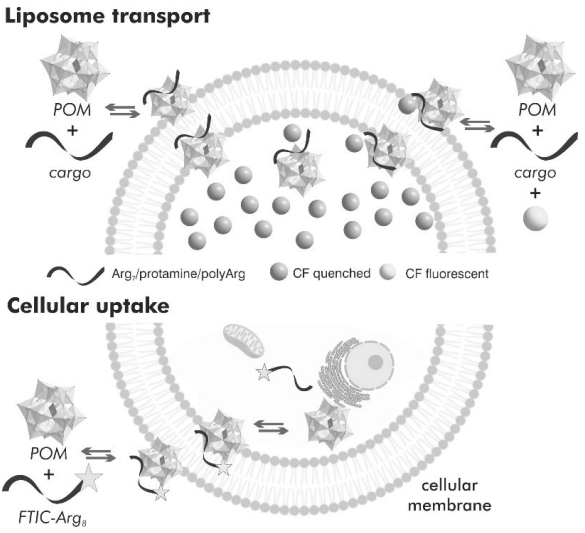

Fig. 1. POM membrane transport in model vesicles and in cells

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