Transmembrane transport of copper(I) with synthetic molecules

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The development of synthetic molecules able to bind and transport ions through bilayer membranes is of great interest as this process is required by living organisms. Deficiencies in copper(I) transport through biological membranes can indeed be linked to diseases such as Menkes and Wilsons diseases.[1] While ionophores for many different ions have been described, ionophores able to transport Cu^+ across lipid bilayers have, to the best of our knowledge, not been reported. Here we present the first Cu^+ synthetic transmembrane transporters.[3]

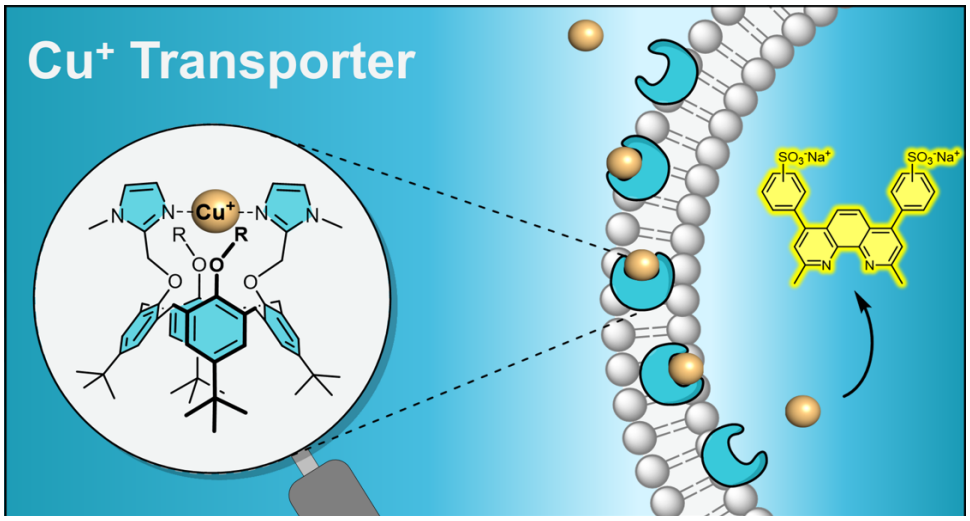

Figure. Transmembrane transport of copper(I) with functionalised calix[4]arenes into a liposome, monitored with an encapsulated fluorophore.

Calixarenes are easily functionalizable hydrophobic molecules, which can be used as platforms for the development of cations receptors. We have synthesized the calix[4]arenes shown in Figure 1[4], which are on their narrow rim functionalized with two imidazole groups. Such receptors exhibit unique host-guest properties, with a high degree of selectivity towards Cu^+ in aqueous environment [5] and in biphasic systems. Transport was evaluated using liposomes as synthetic model membranes, in which a fluorescent dye sensitive to Cu^+ was encapsulated. An analogue of these calix[4]arenes without any ^{t}Bu groups was syntesized and could transport Cu^+ when delivered from an organic solution, opening the way for the study of the effect of synthetic Cu^+ transporters. We will present how the observed transmembrane transport of Cu^+ is caused by the unique structure of the receptors and through which mechanism Cu^+ is transported.

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