Transmembrane Anion Transport by Imidazolinium-based Multiblock Amphiphile

([1]*School of Life Science and Technology, Tokyo Institute of Technology*, [2]*Graduate School of Medical Life Science, Yokohama City University,* [3]*Medical Sciences Innovation Hub Program, RIKEN,* [4]*Graduate School of Engineering, University of Tokyo*) ○Miki Mori,[1] Kohei Sato,[1] Toru Ekimoto,[2] Shinichi Okumura,[2] Mitsunori Ikeguchi,[2,3] Kazuhito Tabata,[4] Hiroyuki Noji,[4] Kazushi Kinbara[1]

Keywords: Multiblock amphiphile; Anion transport; Lipid bilayer membranes; Imidazolinium

Preservation and regulation of ion-concentration gradients across the biological membranes is important in cellular events, such as apoptosis and proliferation. In nature, ion transport across the membranes is realized by membrane transporters embedded in the lipid bilayer membranes. Meanwhile, dysregulation of ion transport, especially that of anion transport, is considered to cause serious diseases such as cystic fibrosis.

Previously, our group has reported that multiblock amphiphiles, consisting of alternatingly aligned hydrophobic aromatic units and hydrophilic oligo (ethylene glycol) chains, can transport ions across the lipid bilayer membranes[1)]. In this study, we newly developed an imidazolinium-based multiblock amphiphile (**IMA**), which bears imidazolinium ion at the center of hydrophobic unit as an anion recognition site (**Figure**).

We investigated the ion transport activity of **IMA** using liposomes as model membranes. Interestingly, **IMA** transported anions as a mobile carrier, with selectivity for nitrate. ^{1}H NMR titration experiment in solution indicated that **IMA** recognizes anions via $(C–H)^+\cdots X^-$ hydrogen bond of imidazolinium ring. Furthermore, the results of all-atom molecular dynamics simulation were consistent with experimental results, suggesting that the **IMA** forms dimeric species during anion transport[2)].

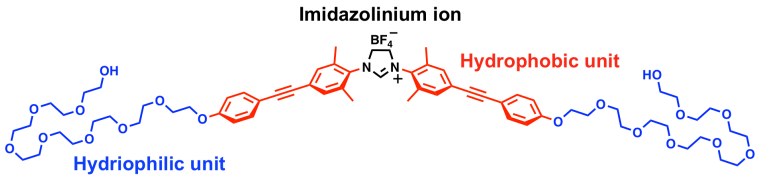

Figure. Molecular structure of **IMA**

1) T. Muraoka, T. Shima, T. Hamada, M. Morita, M. Takagi, K. V. Tabata, H. Noji and K. Kinbara *J. Am. Chem. Soc.,* **2012**, *134*, 19788. 2) M. Mori, K. Sato, T. Ekimoto, S. Okumura, M. Ikeguchi, K. V. Tabata, H. Noji and K. Kinbara, *Chem. Asian J.*, published online (https://doi.org/10.1002/asia.202001106).