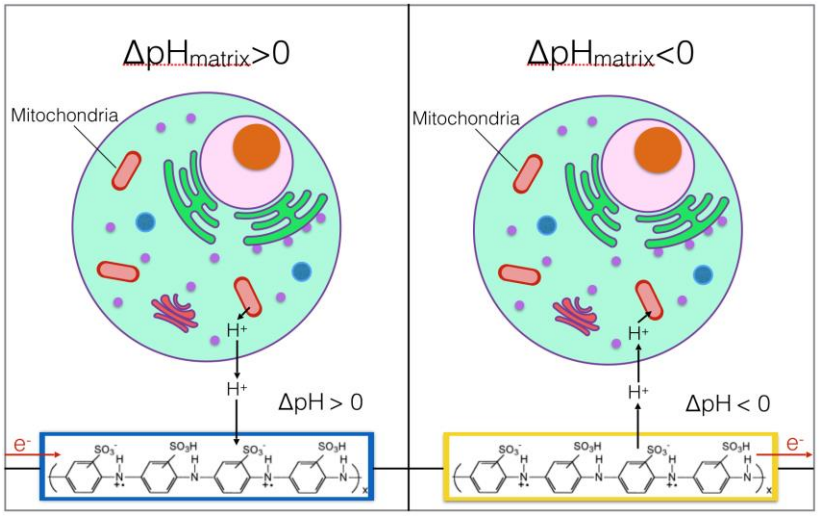
pH modulation in adhesive cells with a protonic biotransducer

早大院情報生産 [1]，東京農工大 [2]，○(D) 崔 銘胤 [1]，(M2) 劉 炳甫 [1]，太田 善浩 [2]，三宅 丈雄 [1]

Graduation School of Information, Production and System, Waseda Univ. [1], Tokyo University of Agriculture and Technology [2], ○Mingyin Cui[1], Bingfu Liu[1], Yoshihiro Ota [2], Takeo Miyake[1]

E-mail: cuimingyin@toki.waseda.jp

Protons (H+) is essential to most physiological activities of organelles and cells. Proton transport across the cell membrane regulates cell functions like maintenance of intracellular pH, which is involved in the process of cell volume regulation, small molecules transport and insulin action. Protonic biodevices are directly coupled with H+ concentration (pH) to facilitate engineering interactions with these physiological processes through proton motive force, due to both proton gradient and potential gradient across the cell membrane. In the previews work, Miyake's lab has demonstrated a H+-biotransducer that can successfully control the rate of ATP synthesis in the isolated mitochondria with controlled H+ transmitter [1]. However, a mitochondria functions with glycolysis in metabolic pathway inside a cell. Furthermore, pH modulation in the cells faces problems such as insufficient proton transport from the outside to the inside of the cell and self-regulation of pH in the cells. Here we focused on sufficient pH modulation in the cells with our protonic biotransducer. While the isolated mitochondria is directly coupled with H+ concentration, the cell prevent ionic flow through the cellular membrane, so an access to cellular cytoplasm is required for function modulation. In this research, the purpose is to improve pH modulation ability with SPA-based



biotransducer and to make an interactive communication with the cell.

Fig.1. Shemetic of Intracellular cell functions modification by proton bio-device

Reference

[1] Ziyi Zhang, Hiroko Kashiwagi, Sawako Kimura, Shuyi Kong, Yoshihiro Ohta, Takeo Miyake, "A protonic biotransducer controlling mitochondrial ATP synthesis", Scientific Reports, 8, 10423, 2018.