

金属製ナノ加工穿刺スタンプによる細胞内物質導入

Au-based nanostraw membrane stamping for direct delivery

of multi molecules into adhesive cells

早大院情報生産¹, 佐原 航平¹, 張 博文¹, 鄭 迪諾¹, 三宅 文雄¹

Waseda Univ.¹, Kohei Sahara¹, Zhang Bowen¹, Shi Yiming¹, Takeo Miyake¹

E-mail: a4ta10@akane.waseda.jp



Delivering ions and molecules into the cell has become an important challenge in biological and medical research fields. Examples include gene injection to create induced pluripotent stem (iPS) cells or to inhibit gene expression inside the cells, which is called RNA interference. However, common molecular delivery has several issues such as physical (electroporation, nanotubes) and chemical (viruses, liposome) damage to functional cells. Here we demonstrate a direct delivering of molecules (from small molecule (calcein) to large molecule (protein)) into NIH-3T3 and HeLa cells with Au nanostraw membrane stamping that results in highly efficient delivery (> 90%) and viability (ca. 90%) [1]. We developed Au nanostraw membrane with electroless plating on track-etched polycarbonate template and O₂ reactive ion etching (RIE). After the RIE, we confirmed Au nanostraws with a scanning electron microscope. To make a nanostraw stamp, we mounted Au nanostraws (Diameters: 400nm, 600nm, 1000nm and Lengths: 0 – 10 μm) on glass tubes with water proof glue and then pour a PBS including target molecules, which is an impermeable molecule into the cell membrane. Then we stamped it to adhesive cells for delivering the target molecules and confirmed the delivered molecules with fluorescence microscope.

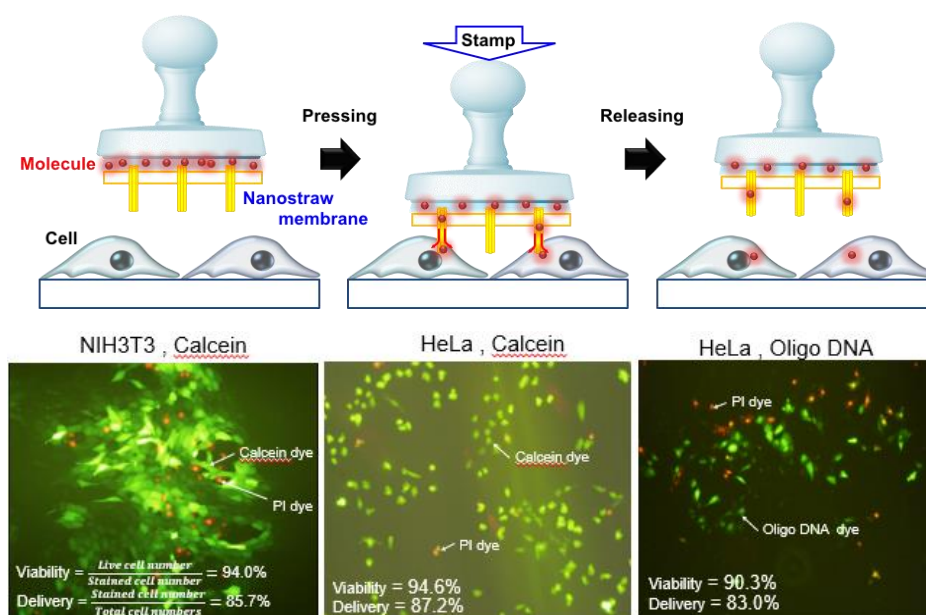


Fig.1 Overview of nanostraw membrane stamping and molecular delivering into adhesive cells

REFERENCES

[1] B. Zhang et. al, *Scientific Reports*, 9, 6806, 2019.