Single-cell observation of Protozoa using microfluidic devices

Itsuka KUMANO[1], Makoto SUEYOSHI[2], Yusuke MATSUMOTO[2], Katsuki HIRATA[2], Yuki MATSUMOTO[2],Kazufumi HOSODA[2], Hiroaki SUZUKI[2,3] and Tetsuya YOMO[2,3]
([1]Grad. Sch. Engn., Osaka Univ., [2]Grad. Sch. Infrom. Sci. Tech., Osaka Univ., [3]ERATO, JST)

SUMMARY

Observing a single cell of Protozoa in real time is effective to meet goals of studying their division, predation, digestion, and dynamics of endosymbionts inside the Protozoan cell, but is difficult because of their high motility. In a previous study, the single cell observation was achieved by encapsulating a Protozoan cell in a microchamber with a diameter of about 100 μm, but it still presented the problem that the Protozoan cell soon depleted the nutrient because the volume of the culture medium in the chamber was very small. For this study, we constructed a microfluidic device as a new method that enabled us to conduct continuous observation of living motile cells at single-cell level under microscope. This device was designed and fabricated using standard soft lithography method and was made of polydimethylsiloxane (PDMS). In this device, by trapping each single Protozoan cell at each gate of multiple narrow channels with a width of ca. 3 μm, multiple living single cells were visible under constant condition with a fresh culture medium. We applied *Tetrahymena thermophila* in this channel and trapped them for several hours, observing their divisions. This device is also expected to be used for trapping varieties of other Protozoa.