

DEVELOPMENT OF ON-CHIP AUTOMATIC CELL SENSING AND EJECTION SYSTEM



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What's New ? : Single Cell Dispensing by Disposable Microchip

Abstract:

We succeeded in automatic dispensing of a single swine oocyte (ϕ =100 µm) from a biochip to atmosphere using developed cell ejection system. The developed system is composed of a cell loader, an inkjet mechanism and a capacitance sensor to dispense a droplet with a single cell. The performance of the sensor and the inkjet were evaluated using the fabricated micro-fluidic chip. We succeeded in sensing the passage of microbeads and oocytes (ϕ =50-100 µm) with the velocity of over 6 mm/s using a capacitance sensor which was fabricated on a glass substrate by photolithography techniques. The advantages of proposed system were that composed of the reusable drive system and a disposable biochip.



Experiments: Fabrication: **Droplet generation** 1 Nozzle 2 Electrode 3 Micro channel .Supatter(Cr/Au) Spincoat for Air pulse generator Out-port & Resist patterning thin PDMS Channe Max. freq.: 500 Hz, Pressure: 0.05 MPa PDMS SU-8 Φ0.7mm ... 2. Au wet etching 2.Assmbly (Plasm S 0 Nozzle assemble Au etchant Н Generated droplets Experimental platform (size: 1mm, volume 0.4 µl) 3.Cr wet etching Cell sensina Ni nozzle Cr etcha Ф0.3x0.7x2.0mr 1 2 3 (4) (5) (6) (7) (8) Conditions Input volt.: 0.01 V, Amp,: Rock-in-amp Solution: medium Time [s 8.00 8.0 Application: 8.04 Sensor 8.02 Single swine oocyte dispensing with sensor feedback 1.6 1.8 0.4 1.4 0,6 0.8 Time [s] Velocity measured by camera [mm/s] Particle detection by capacitance sensor Real time estimation of ejection timing Estimated velocity Conclusion & Further Works : We succeeded in automatic • On-chip single cell sensing and ejection system. dispensing of a single oocyte · Dispensing of single swine oocyte by developed system.

[Reference]

 - T. Kawahara, T. Mizunuma, H. Uvet, M. Hagiwara, Y. Yamanishi, and F. Arai: Development of On-Chip Automatic Cell Sensing and Ejection System, 14th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS), pp.1781-1783, 2010.

(d=100 µm) by developed system.

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Improvement of success rate/ Development of loading mechanism.