

Body on a Chip: A way to mimic a body on a chip

Osamu Tabata*, *Fellow, IEEE, IEEJ*
Yoshikazu Hirai**, *Fellow, IEEE, IEEJ*
Kenichiro Kamei***, *Fellow, IEEE, IEEJ*

* Kyoto University of Advanced Science
E-mail : tabata.osamu@kuas.ac.jp

** Graduate School of Engineering, Kyoto University
hirai@me.kyoto-u.ac.jp

*** Institute for Advanced Science (KUIAS), Kyoto University
kamei.kenichiro.7r@kyoto-u.ac.jp

Abstract

In vitro cell-based assay with human cells is getting attention since the accuracy of preclinical predictions of drug responses should be improved to reduce costly failures in clinical trials. In order to generate reliable predictions, a micro-engineered biomimetic systems, so called “Body on a Chip: BoC” was proposed. The BoC make it possible to investigate the effects of drugs/metabolites on various organs by assembling a closed-loop medium circulation system on one microfluidic device. In this talk, we demonstrate our two examples. One is a BoC in which human heart and liver cell lines are integrated to evaluate the effects of an anti-cancer drug (doxorubicin) on cell survival. The next is a BoC in which human gut and liver cell lines are integrated to investigate Non-alcoholic fatty liver disease (NAFLD). In both examples, a three-dimensional (3D) polymeric device fabrication technique based on the reliable 3D lithography with the process optimization method is applied to realize a better performance of the integrated fluidic components such as a valve and a pump.

Short Bio



Osamu Tabata received his M.S. and Ph.D. degrees from Nagoya Institute of Technology, Japan, in 1981 and 1993, respectively. Since April 2005, Osamu Tabata has been a Professor at Graduate School of Engineering, Kyoto University, Japan. October 2019, he moved to Kyoto University of Advanced Science as a founding Dean of New Engineering School launched in 2020. He is currently engaged in research on micro/nano processes, MEMS, DNA nanotechnology.

He is an editorial board member of the Microsystems & Nanoengineering and Journal Sensors and Actuators. From 2020, he has been serving as a chair of the Robert Bosch Award Committee for EDS. He is a Fellow of Institute of Electrical and Electronics Engineers and Institute of Electrical Engineer Japan.



Ken-ichiro Kamei is an associate professor of WPI-iCeMS, Kyoto University, where he joined as faculty member from 2010. He obtained his Dr. of Engineering from Tokyo Institute of Technology in 2003. During 2003-2006, he was a postdoctoral fellow at the Molecular Biology Institute, the University of California, Los Angeles (UCLA). In 2006, he was promoted as a staff research associate at the California NanoSystems Institute (CNSI), UCLA. His current research is to develop nano/microengineered platforms to precisely manipulate hPSCs for advancement of developmental biology as well as clinical and industrial applications.



Yoshikazu Hirai received the Ph.D. degree from Kyoto University, Japan, in 2007. Since 2021, he has been a Junior Associate Professor with the Department of Mechanical Engineering and Science, Kyoto University. His current research interests include Fabrication and Packaging for Generic MEMS/NEMS, Silicon/Polymer based MEMS devices and systems, Atomic MEMS devices, and Microphysiological systems. He has received several academic awards such as The Institute of Electrical Engineers of Japan (IEEJ) Distinguished Paper Award in 2017, and Outstanding Reviewer Awards in 2016 of Journal of Micromechanics and Microengineering. He is an Editorial Board member of IEEE Transactions on Nanotechnology.