

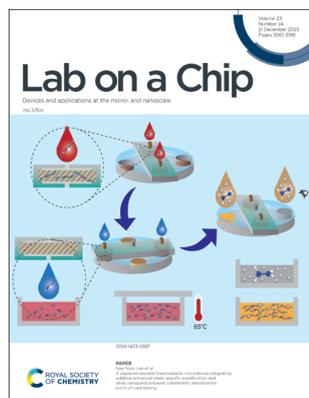
# Lab on a Chip

Devices and applications at the micro- and nanoscale  
rsc.li/loc

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

## IN THIS ISSUE

ISSN 1473-0197 CODEN LCAHAM 23(24) 5061-5196 (2023)



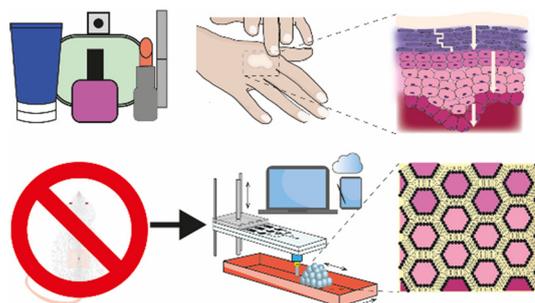
**Cover**  
See Nae Yoon Lee *et al.*,  
pp. 5081–5091.  
Image reproduced by  
permission of Nae Yoon Lee  
from *Lab Chip*, 2023, **23**, 5081.  
Image credit: Heewon Choi.

## PERSPECTIVE

5068

### Towards skin-on-a-chip for screening the dermal absorption of cosmetics

Jessica Govey-Scotland, Liam Johnstone, Connor Myant and Mark S. Friddin\*

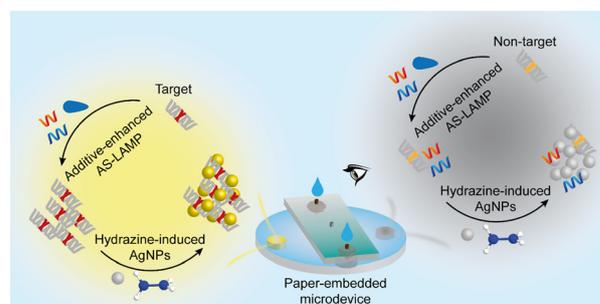


## PAPERS

5081

### A paper-embedded thermoplastic microdevice integrating additive-enhanced allele-specific amplification and silver nanoparticle-based colorimetric detection for point-of-care testing

Duc Anh Thai, Seung Kyun Park and Nae Yoon Lee\*



## Editorial Staff

### Executive Editor

Rebecca Garton

### Deputy Editor

Alice Smallwood

### Editorial Production Manager

Sarah Whitehouse

### Development Editor

David Lake

### Publishing Editors

Gabriel Clarke, Derya Kara-Fisher,  
Emma Stephen, Ziva Whitelock

### Editorial Assistant

Leo Curtis

### Publishing Assistant

Andrea Whiteside

### Publisher

Jeanne Andres

For queries about submitted papers please contact Sarah Whitehouse, Editorial Production Manager, in the first instance. E-mail: [loc@rsc.org](mailto:loc@rsc.org)

For pre-submission queries please contact Rebecca Garton, Executive Editor.

E-mail: [loc-rsc@rsc.org](mailto:loc-rsc@rsc.org)

Lab on a Chip (electronic: ISSN 1473-0189) is published 24 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

Tel +44 (0)1223 432398; E-mail [orders@rsc.org](mailto:orders@rsc.org)

2023 Annual (electronic) subscription price: £1617; US\$2902. Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at [www.rsc.org/ip](http://www.rsc.org/ip)

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

### Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;

E-mail [advertising@rsc.org](mailto:advertising@rsc.org)

For marketing opportunities relating to this journal, contact [marketing@rsc.org](mailto:marketing@rsc.org)

# Lab on a Chip

Devices and applications at the micro- and nanoscale

[rsc.li/loc](http://rsc.li/loc)

*Lab on a Chip* provides a unique forum for the publication of significant and original work related to miniaturisation, at the micro- and nano-scale, of interest to a multidisciplinary readership. The journal seeks to publish work at the interface between physical technological advancements and high impact applications that are of direct interest to a broad audience.

## Editorial board

### Editor-in-Chief

Aaron Wheeler, University of Toronto, Canada

### Associate Editors

Jean-Christophe Baret, University of

Bordeaux

Yoon-Kyoung Cho, UNIST, South Korea

Amy Herr, University of California, Berkeley,

USA

Séverine Le Gac, University of Twente,

The Netherlands

Hang Lu, Georgia Institute of Technology, USA

Xingyu Jiang, Southern University of Science

and Technology, Shenzhen, China

Manabu Tokeshi, Hokkaido University, Japan

Hongkai Wu, Hong Kong University of Science

and Technology, China

## Advisory Board

Esther Amstad, Swiss Federal Institute of

Technology in Lausanne (EPFL), Switzerland

Yoshinobu Baba, Nagoya University, Japan

Holger Becker, microfluidic ChipShop GmbH,

Germany

Anja Boisen, Technical University of Denmark,

Denmark

Oscar Ces, Imperial College London, UK

Dino Di Carlo, University of California, Los

Angeles, USA

Stephanie Descroix, Institut Curie, France

Petra Dittrich, ETH Zurich, Switzerland

Xudong Fan, University of Michigan, USA

Qun Fang, Zhejiang University, China

Albert Folch, University of Washington, USA

Piotr Garstecki, Institute of Physical Chemistry

of the Polish Academy of Sciences, Poland

Martin A. M. Gijs, EPFL, Switzerland

Mark Gilligan, Dolomite, UK

Keisuke Goda, University of Tokyo, Japan

Mei He, University of Kansas, USA

Tony Jun Huang, Duke University, USA

Yanyi Huang, Peking University, China

Daniel Irimia, Massachusetts General

Hospital, USA

David Issadore, University of Pennsylvania,

USA

Noo Li Jeon, Seoul National University, South

Korea

Michelle Khine, University of California,

Irvine, USA

Sunghoon Kwon, Seoul National University,

South Korea

Wlibur Lam, Georgia Institute of Technology

and Emory University, USA

Abraham Lee, University of California, Irvine,

USA

Gwo-Bin Lee, National Tsing Hua University,

Taiwan

Weihua Li, University of Wollongong, Australia

Xiujun Li, University of Texas at El Paso, USA

Chwee Teck Lim, National University of

Singapore, Singapore

Ai Qun Liu, The Hong Kong Polytechnic

University, China

Adrian Neild, Monash University, Australia

Nam-Trung Nguyen, Griffith University,

Australia

Nicole Pamme, Stockholm University, Sweden

Ian Papautsky, University of Illinois at Chicago,

USA

Jianhua Qin, Dalian Institute of Chemical

Physics, China

Sámuel Sánchez, Institute of Bioengineering of

Catalonia, Spain

Anderson Shum, University of Hong Kong,

China

David Sinton, University of Toronto, Canada

Shoji Takeuchi, University of Tokyo, Japan

Sindy Tang, Stanford University, USA

Yi-Chin Toh, Queensland University of

Technology, Australia

Albert van den Berg, University of Twente,

The Netherlands

Joel Voldman, Massachusetts Institute of

Technology, USA

Jeff Tza-Huei Wang, Johns Hopkins University,

USA

David Weitz, Harvard University, USA

George Whitesides, Harvard University, USA

Chaoyong James Yang, Xiamen University,

China

Po Ki Yuen, Corning Incorporated, New

York, USA

Roland Zengerle, Hahn-Schickard, Germany

Weian Zhao, University of California, Irvine,

USA

## Information for Authors

Full details on how to submit material for publication in *Lab on a Chip* are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's homepage: [rsc.li/loc](http://rsc.li/loc)

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023.

Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

© The paper used in this publication meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).

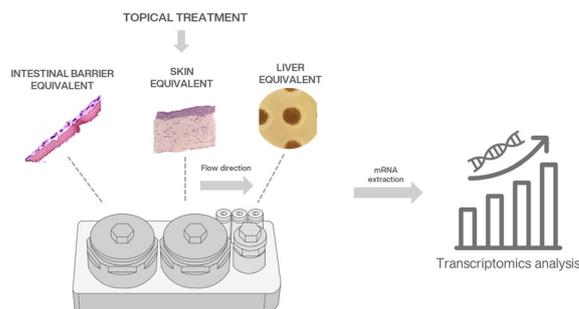
Registered charity number: 207890



5092

### Combining a microphysiological system of three organ equivalents and transcriptomics to assess toxicological endpoints for cosmetic ingredients

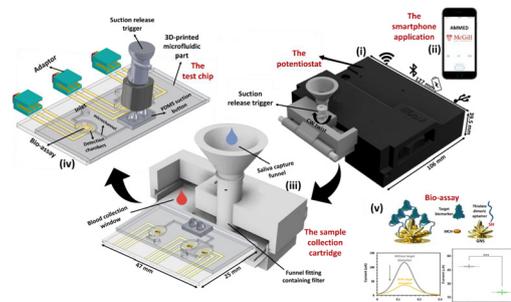
Nathalia de Carvalho Indolfo, Melissa Dibbern Ganzler, Tábata Renée Doratioto, Thayná Mendonça Avelino, Larissa Bueno Tofani, Luis Antonio Peroni, Renata Santos Rabelo, Kelen Fabiola Arroteia and Ana Carolina Migliorini Figueira\*



5107

### Additively manufactured multiplexed electrochemical device (AMMED) for portable sample-to-answer detection

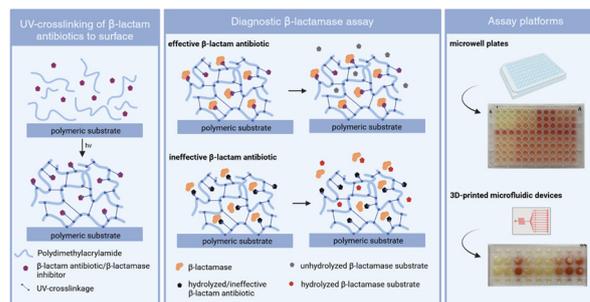
Arash Khorrami Jahromi, Roozbeh Siavash Moakhar, Sripadh Guptha Yedire, Hamed Shieh, Katerina Rosenflanz, Amber Birks, Justin de Vries, Yao Lu, Houda Shafique, Julia Strauss and Sara Mahshid\*



5120

### Highly efficient $\beta$ -lactamase assay applying polydimethylacrylamide-based surface functionalization with $\beta$ -lactam antibiotics and $\beta$ -lactamase inhibitors

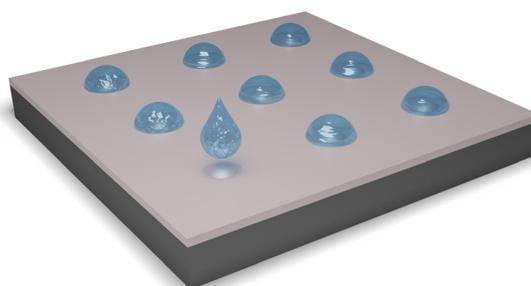
Simone Rentschler, Max Borgolte, Alexander Filbert, Stefan Laufer and Hans-Peter Deigner\*



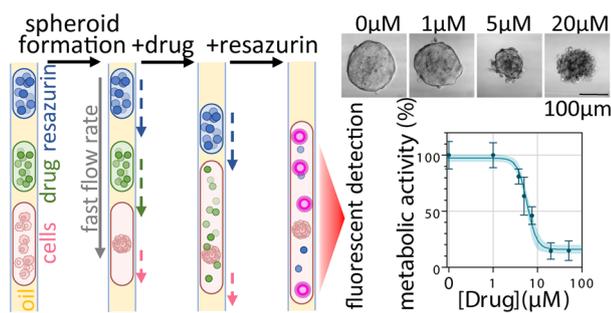
5131

### Ultrasonic spectroscopy of sessile droplets coupled to optomechanical sensors

K. G. Scheuer, F. B. Romero, G. J. Hornig and R. G. DeCorby\*



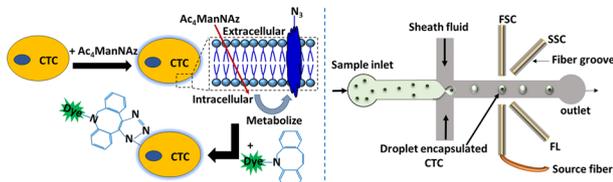
5139



### Simple droplet microfluidics platform for drug screening on cancer spheroids

Caroline Parent,\* Kiran Raj Melayil, Ya Zhou, Vivian Aubert, Didier Surdez, Olivier Delattre, Claire Wilhelm\* and Jean-Louis Viovy\*

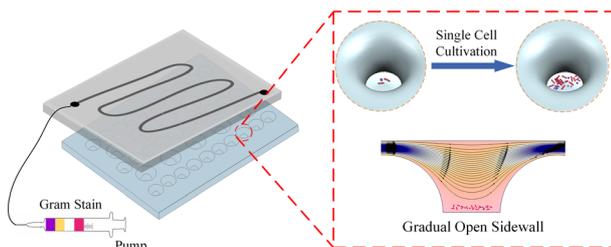
5151



### Optomicrofluidic detection of cancer cells in peripheral blood via metabolic glycoengineering

K. Mirkale,\* S. K. Jain, T. S. Oviya and S. Mahalingam

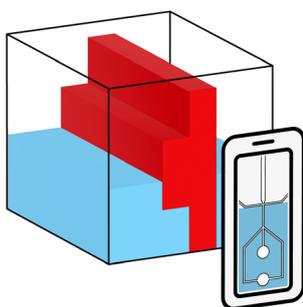
5165



### Advancing *in situ* single-cell microbiological analysis through a microwell droplet array with a gradual open sidewall

Jie Wang, Lin Du, Yuwei Han, Dawei Zhang\* and Dalei Jing\*

5173



### Alignment-free construction of double emulsion droplet generation devices incorporating surface wettability contrast

Yunus Aslan, Olivia McGleish, Julien Reboud and Jonathan M. Cooper\*



5180

## A human initial lymphatic chip reveals distinct mechanisms of primary lymphatic valve dysfunction in acute and chronic inflammation

Samantha Kraus and Esak Lee\*

