

# Biomaterials Science

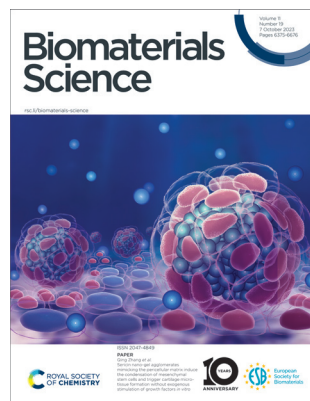
An international high impact journal exploring the underlying science behind the function, interactions and design of biomaterials

[rsc.li/biomaterials-science](https://rsc.li/biomaterials-science)

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 2047-4849 CODEN BSICCH 11(19) 6375–6676 (2023)



### Cover

See Qing Zhang *et al.*,  
pp. 6480–6491.

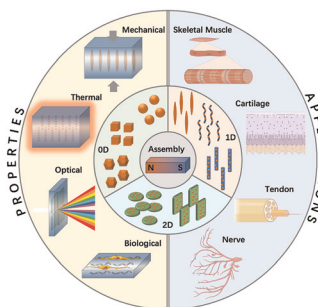
Image reproduced by  
permission of Qing Zhang  
from *Biomater. Sci.*, 2023, **11**,  
6480.

## REVIEWS

6384

### Magnetically anisotropic hydrogels for tissue engineering

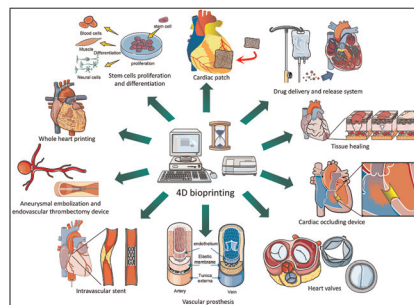
Lili Hao and Hongli Mao\*



6403

### Application of 4D printing and bioprinting in cardiovascular tissue engineering

Zijing Zhou, Weijie Tang, Jinfu Yang and  
Chengming Fan\*



## Editorial Staff

### Executive Editor

Maria Southall

### Deputy Editor

Laura Ghandhi

### Editorial Production Manager

Cara Sutton

### Assistant Editors

Sean Browner, Molly Colgate, Paul Scott, Alison Winder

### Editorial Assistant

Basita Javeed

### Publishing Assistant

Allison Holloway

### Publisher

Sam Keltie

For queries about submitted papers, please contact

Cara Sutton, Editorial Production Manager in the first instance.

E-mail: biomaterialsscience@rsc.org

For pre-submission queries please contact

Maria Southall, Executive Editor.

E-mail: biomaterialsscience-rsc@rsc.org

Biomaterials Science (electronic: ISSN 2047-4849) 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

2023 Annual (electronic) subscription price: £2450, \$4518.

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

For marketing opportunities relating to this journal, contact marketing@rsc.org

# Biomaterials Science

[rsc.li/biomaterials-science](http://rsc.li/biomaterials-science)

An international high impact journal exploring the science of biomaterials and their translation towards clinical use.

## Editorial Board

### Editor-in-chief

Jianjun Cheng, Westlake University, China

### Associate Editors

Khuloud Al-Jamal, King's College London, UK

Nasim Annabi, University of California, Los Angeles, USA

Lino Ferreira, UC-Biotech, Portugal

Jöns Hilborn, Uppsala University, Sweden

Won Jong Kim, POSTECH, Korea

Shyni Varghese, Duke University, USA

Fu-Jian Xu, Beijing University of Chemical Technology, China

Lichen Yin, Soochow University, China

Can Zhang, China Pharmaceutical University, China

Chuan Zhang, Shanghai Jiao Tong University

### Editorial Board Members

Pamela Habibovic, Maastricht University, Netherlands

Xinyuan Zhu, Shanghai Jiao Tong University, China

## Advisory Board

Lihl Adler-Abramovich, Tel Aviv University, Israel

Kazunari Akiyoshi, iCeMS, Japan

Cameron Alexander, University of Nottingham, UK

Edmondo Benetti, ETH Zürich, Switzerland

Mark Bradley, University of Edinburgh, UK

Jayanta Chatterjee, IISC, India

Arabinda Chaudhuri, CSIR-Indian Institute of

Chemical Technology, India

Guoping Chen, National Institute for Materials

Science (NIMS), Japan

Yiyun Cheng, East China Normal University, China

Joel Collier, Duke University, USA

Justin Cooper-White, University of Queensland,

Australia

Honggang Cui, Johns Hopkins University, USA

Jianwu Dai, Institute of Genetics and

Developmental Biology of CAS, China

Cole DeForest, University of Washington, USA

Andrew Dove, University of Birmingham, UK

Yizhou Dong, The Ohio State University, USA

Hongwei Duan, Nanyang Technological University

(NTU), Singapore

Christine Dufes, University of Strathclyde, UK

Nicholas Dunne, Dublin City University, Ireland

Jennifer Elisseeff, Johns Hopkins University, USA

Elisabeth Engel Lopez, IBE, Spain

Shaoqin Sarah Gong, University of Wisconsin-

Madison, USA

Dong Keun Han, Cha University, Korea

Ngan Huang, Stanford, USA

Chris Jewell, University of Maryland, USA

Jian Ji, Zhejiang University, China

Ali Khademhosseini, Terasaki Institute for

Biomedical Innovation, USA

April Kloxin, University of Delaware, USA

Veena Koul, IIT Delhi, India

Christine Le Maitre, Sheffield Hallam University, UK

Haeshin Lee, KAIST, Republic of Korea

Khoon Lim, University of Sydney, Australia

Matthias Lutolf, Ecole Polytechnique Fédérale de

Lausanne, Switzerland

Atsushi Maruyama, Tokyo Institute of Technology,

Japan

Phillip Messersmith, University of California,

Berkeley, USA

Aline Miller, University of Manchester, UK

Hyejung Mok, Konkuk University, Korea

Steve Oh, A\*STAR, Singapore

Shaunak Pandya, Prolong Pharmaceuticals, USA

Ling Peng, Aix-Marseille University, France

Nicholas Peppas, University of Texas at Austin, USA

Catherine Picart, Grenoble INP, France

Tilo Pompe, University of Leipzig, Germany

Suzie Pun, University of Washington, USA

Shun Shen, Tongji University, China

Heungsoo Shin, Hanyang University, Korea

Molly Shoichet, University of Toronto, Canada

Xintao Shuai, Sun Yat-Sen University, China

Aasheesh Srivastava, IISER, India

Patrick Stayton, University of Washington, USA

Marcus Textor, ETH Zurich, Switzerland

Takafumi Ueno, Tokyo Institute of Technology,

Japan

Jun Wang, South China University of Technology,

China

Tanja Weil, Max Planck Institute for Polymer

Research, Germany

Stephanie Willerth, University of Victoria, Canada

Zimei Wu, University of Auckland, New Zealand

Evelyn Yin, Waterloo, Canada

## Information for Authors

Full details on how to submit material for publication in Biomaterials Science 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/biomaterials-science](http://rsc.li/biomaterials-science). Submissions:

The journal welcomes submissions of manuscripts for publication as

Full Papers, Communications, Minireviews and Reviews. Full Papers and

Communications should describe original work of high quality and impact.

Additional details are available from the Editorial Office

or <http://www.rsc.org/authors>

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.

Registered charity number: 207890

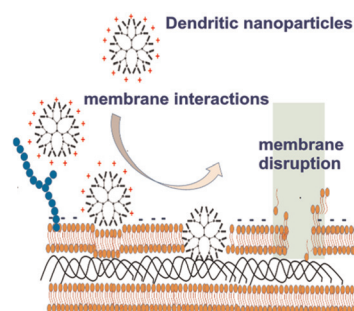


## REVIEWS

6421

### Dendritic systems for bacterial outer membrane disruption as a method of overcoming bacterial multidrug resistance

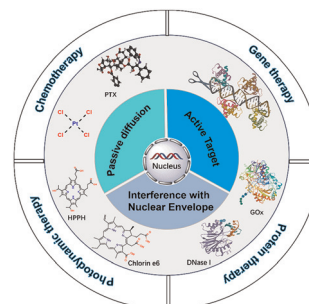
Kinga Skrzyniarz, Dorota Kuc-Ciepluch, Magdalena Lasak, Michał Arabski, Javier Sanchez-Nieves and Karol Ciepluch\*



6436

### Research progress in nucleus-targeted tumor therapy

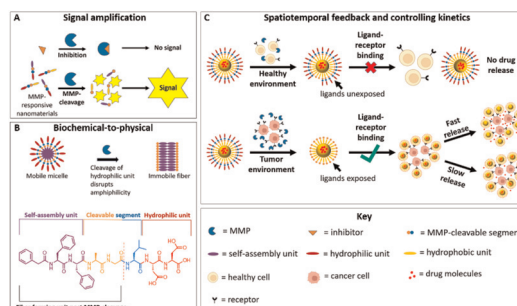
Shaofeng Chen, Rumeng Cao, Ling Xiang, Ziyi Li, Hui Chen, Jiumeng Zhang\* and Xuli Feng\*



6457

### MMP-responsive nanomaterials

Jiye Son, Sadiyah Parveen, Douglas MacPherson, Yaron Marciano, Richard H. Huang and Rein V. Ulijn\*

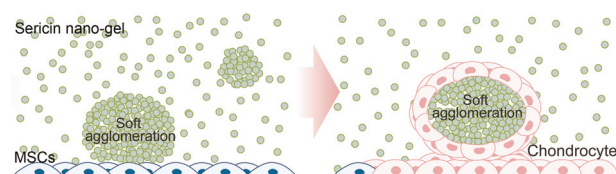


## PAPERS

6480

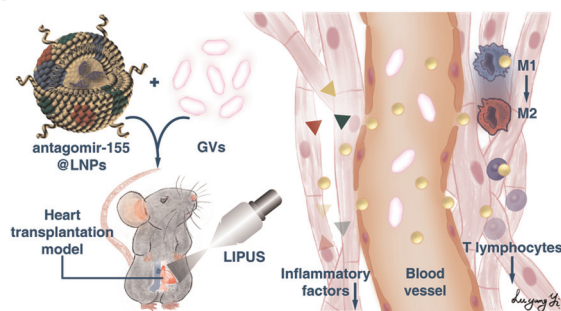
### Sericin nano-gel agglomerates mimicking the pericellular matrix induce the condensation of mesenchymal stem cells and trigger cartilage micro-tissue formation without exogenous stimulation of growth factors *in vitro*

Qing Zhang,\* Wei Zhou, Futing Yang and Jifeng Shi



## PAPERS

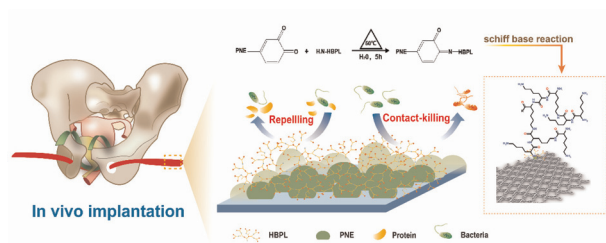
6492



### Targeted microRNA delivery by lipid nanoparticles and gas vesicle-assisted ultrasound cavitation to treat heart transplant rejection

Rui Wang, Luyang Yi, Wuqi Zhou, Wenyuan Wang, Lufang Wang, Lingling Xu, Cheng Deng, Mengrong He, Yuji Xie, Jia Xu, Yihan Chen, Tang Gao, Qiaofeng Jin,\* Li Zhang\* and Mingxing Xie\*

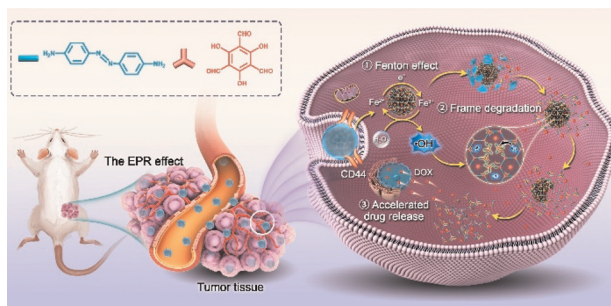
6504



### Fabrication and *in vitro* investigation of hyperbranched poly-lysine-grafted warp knitted polypropylene sling for potential treatment of stress urinary incontinence

Shuying Zhao, Meiqi Fang, Yan Li,\* Fujun Wang, Hao Li and Lu Wang

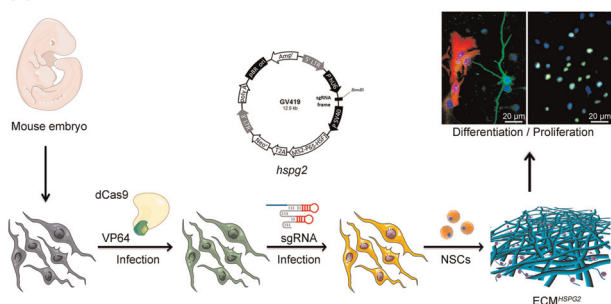
6524



### Biodegradable covalent organic frameworks achieving tumor micro-environment responsive drug release and antitumor treatment

Tong Li, Dianwei Wang, Zhaopei Guo, Lin Lin, Meng Meng, Cong Liu, Kai Hao,\* Xuan Pang, Huayu Tian\* and Xuesi Chen

6537



### A precise design strategy for a cell-derived extracellular matrix based on CRISPR/Cas9 for regulating neural stem cell function

Yuanxin Zhai, Lingyan Yang,\* Wenlong Zheng, Quanwei Wang, Zhanchi Zhu, Fang Han, Ying Hao, Sancheng Ma\* and Guosheng Cheng\*



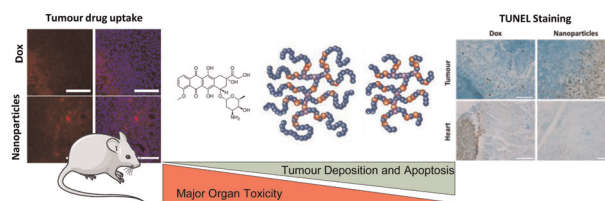


## PAPERS

6545

### Chain-extension in hyperbranched polymers alters tissue distribution and cytotoxicity profiles in orthotopic models of triple negative breast cancers

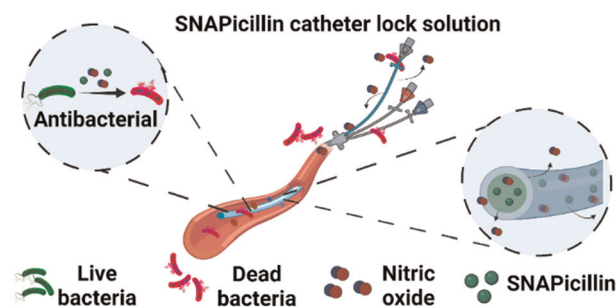
Cara Moloney,\* Fatemeh Mehradnia, Robert J. Cavanagh, Asmaa Ibrahim, Amanda K. Pearce, Alison A. Ritchie, Philip Clarke, Ruman Rahman, Anna M. Grabowska and Cameron Alexander\*



6561

### Antimicrobial efficacy of a nitric oxide-releasing ampicillin conjugate catheter lock solution on clinically-isolated antibiotic-resistant bacteria

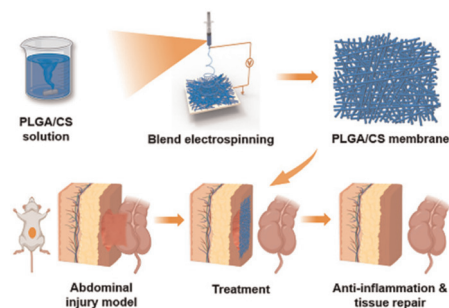
Manjyot Kaur Chug, Lauren Griffin, Mark Garren, Emma Tharp, Grace H. Nguyen, Hitesh Handa and Elizabeth J. Brisbois\*



6573

### An anti-inflammatory chondroitin sulfate-poly(lactic-co-glycolic acid) composite electrospinning membrane for postoperative abdominal adhesion prevention

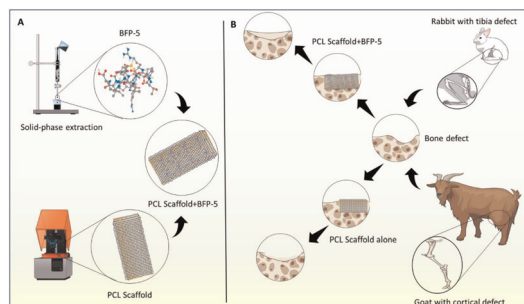
Rui Gao, Fenghui Li, Yushan Zhang, Pengxu Kong, Yu Gao, Jingrong Wang, Xiang Liu, Shuangyang Li, Liqin Jiang,\* Ju Zhang, Chuangnian Zhang, Zujian Feng,\* Pingsheng Huang and Weiwei Wang\*



6587

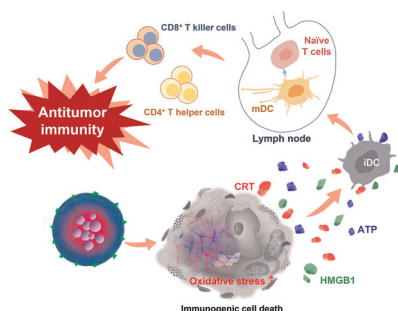
### Peptide derived from stromal cell-derived factor 1 $\delta$ enhances the *in vitro* expression of osteogenic proteins *via* bone marrow stromal cell differentiation and promotes bone formation in *in vivo* models

Jong Keun Seon, Sree Samanvitha Kuppa, Ju Yeon Kang, Jun Sik Lee, Su A Park, Taek Rim Yoon, Kyung Soon Park and Hyung Keun Kim\*



## PAPERS

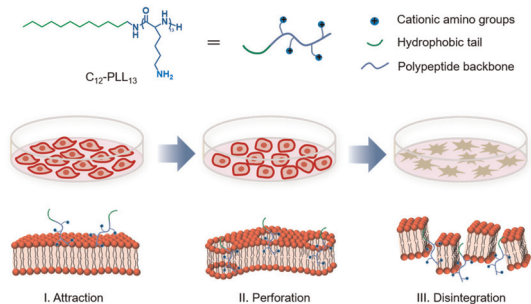
6600



### Acid-sensitive stable polymeric micelle-based oxidative stress nanoamplifier as immunostimulating anticancer nanomedicine

Gayoung Kwon, Jinsu Baek, Nuri Kim, Soonyoung Kwon, Nanhee Song, Seong-Cheol Park, Byeong-Su Kim and Dongwon Lee\*

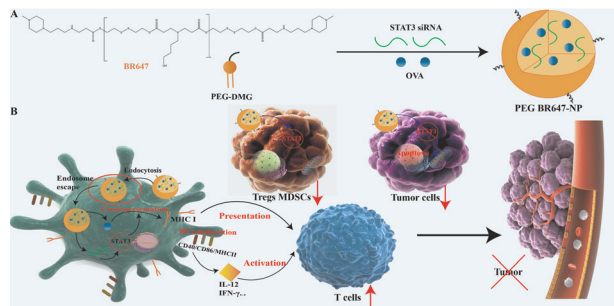
6611



### Synthetic lipo-polylysine with anti-cancer activity

Xuan Yi, Pengqi Wan, Wei Shen, Xiaonong Zhang, Peng Zhang\* and Chunsheng Xiao\*

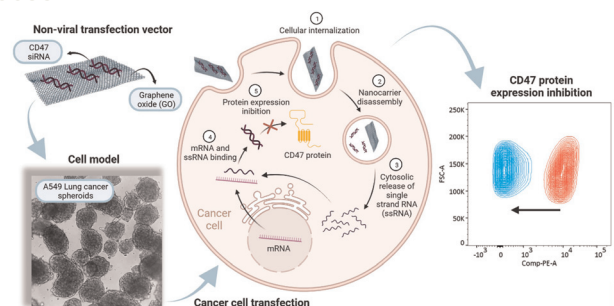
6619



### Dual-responsive PEG–lipid polyester nanoparticles for siRNA and vaccine delivery elicit anti-cancer immune responses by modulating tumor microenvironment

Zixu Liu, Linxuan Zhao, Yupeng Feng, Qingqing Wang, Nan Dong, Yu Zhang, Tian Yin, Haibing He, Xing Tang,\* Jingxin Gou\* and Li Yang\*

6635



### Harnessing graphene oxide nanocarriers for siRNA delivery in a 3D spheroid model of lung cancer

Francesca Grilli, Eman M. Hassan, Fabio Variola and Shan Zou\*

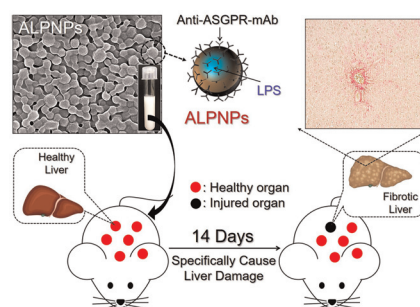


## PAPERS

6650

### Synthesis, characterization, and biological verification of asialoglycoprotein receptor-targeted lipopolysaccharide-encapsulated PLGA nanoparticles for the establishment of a liver fibrosis animal model

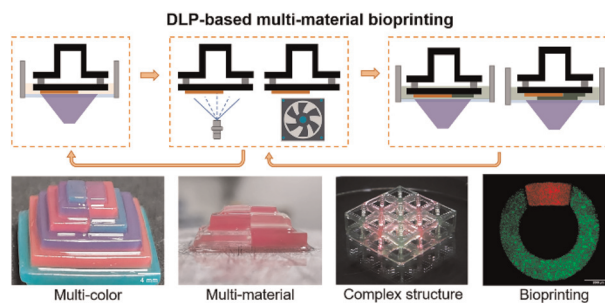
Ching-Ju Huang, Shao-Jung Hsu, Yi-Chiung Hsu, Liang-Kun Chen, Chuan Li, Hui-Chun Huang\* and Yu-Hsiang Lee\*



6663

### Development of digital light processing-based multi-material bioprinting for fabrication of heterogeneous tissue constructs

Hao Su, Bingxian Lu, Ming Li, Xue Yang, Minghao Qin and Yang Wu\*



## EXPRESSION OF CONCERN

6674

### Expression of Concern: Low-intensity focused ultrasound (LIFU)-activated nanodroplets as a theranostic agent for noninvasive cancer molecular imaging and drug delivery

Jianxin Liu, Fenfen Xu, Ju Huang, Jinshun Xu, Yang Liu, Yuanzhi Yao, Meng Ao, Ao Li, Lan Hao, Yang Cao, Zhongqian Hu, Haitao Ran, Zhigang Wang and Pan Li\*

