

Biomaterials Translational

VOL
02

生物材料转化电子杂志(英文)

Volume 2 Issue 1 March 2021



COVID-19:

Challenges and Opportunities to
Biomaterials Science and
Translational Medicine

Respiratory Droplets
Main carrier for COVID-19 transmission

Biomaterial Source for Diagnosis
*Plant-produced recombinant SARS-CoV-2
receptor-binding domain*

Enveloped Viruses in Indoor
Fate and transport of microbes in indoor built spaces

ISSN 2096-112X
CN 11-9367/R



Responsible Institution

National Health Commission of the People's Republic of China

Sponsor

Chinese Medical Association
42 Dongsi Xidajie, Beijing 100710, China

Publishing

Chinese Medical Multimedia Press Co., Ltd.
62 Dongheyan Street, Beijing 100052, China
Tel: 0086-10-51322622

Executed by

Union Hospital affiliated to Tongji Medical College of Huazhong University of Science and Technology
1277 Jiefang Avenue, Wuhan, Hubei Province, China

Copyright © 2021 by

Chinese Medical Association
No content published by the journals of Chinese Medical Association may be reproduced or abridged without authorization. Please do not use or copy the layout and design of the journals without permission.

Editing

Editorial Office of *Biomaterials Translational*

Editors-in-Chief

Zengwu Shao

Huazhong University of Science and Technology, China

Xu Cao

Johns Hopkins University, USA

Qian Wang

University of South Carolina, USA

Websites

<http://www.biomat-trans.com/>

Online Submission

https://www.editorialmanager.com/biomater_transl/

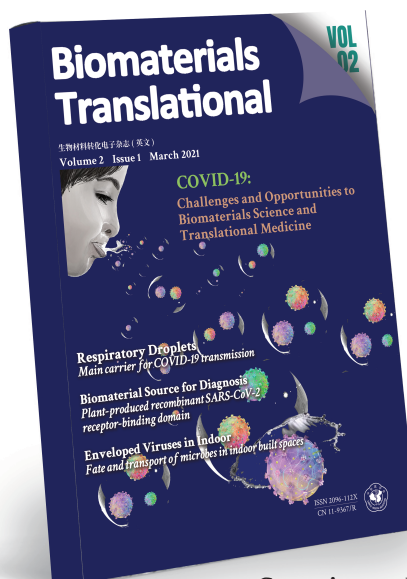
Contact

1277 Jiefang Avenue, Wuhan, Hubei Province, China
Email: editors@biomat-trans.com
Tel: 0086 13437105155

Periodical Registration

ISSN 2096-112X
CN 11-9367/R

Biomaterials Translational is an electronic journal, which will be printed on demand of readers.



Cover image: Florence R. Wang

Biomaterials Translational is an international journal publishing research at the interface of translational medicine, biomaterials science and engineering. The journal publishes original, high-quality, peer-reviewed papers including original research articles, reviews, viewpoints and comments. Translational medicine is an interdisciplinary field that applies emerging new technologies and sciences to the prevention, diagnosis and treatment of human disease, with a particular focus on animal disease models in the application of biomaterials for treatments. Thus, the journal highlights breakthrough discoveries in basic science and clinical application of biomaterials, as well as other significant findings related to the translation of biomaterials.

The scope of the journal covers a wide range of physical, biological and chemical sciences that underpin the design of biomaterials and the clinical disciplines in which they are used.

Original articles will be considered for publication within, but not limited to, the following domains:

- Investigation of human biology and pathogenesis of diseases with potential applications of biomaterials in treatment
- Synthesis, characterization and biomedical potential of metallic, ceramic, polymeric, composite and hybrid biomaterials
- Physical, chemical, biological, pharmaceutical and toxicological features of biomaterials
- Drug and gene delivery system design, with a focus on its application to disease conditions
- Short-term and long-term biocompatibility of biomaterials
- *In vivo* disease models and the biology of the host response in application of novel biomaterials
- Biomaterials design for modern diagnosis and therapeutic clinical practice (bioimaging, biosensing, biotherapy)
- Stem cell-biomaterial-based tissue engineering

THE FIRST EDITORIAL BOARD

Honorary Editors-in-Chief*

Xiaobing Fu, Chinese PLA General Hospital, China
James T. Triffitt, University of Oxford, UK
Yingjun Wang, South China University of Technology, China
Yingze Zhang, Hebei Medical University, China

Editors-in-Chief

Zengwu Shao, Huazhong University of Science and Technology, China
Xu Cao, Johns Hopkins University, USA
Qian Wang, University of South Carolina, USA

Associate Editors

Zhidao Xia, Swansea University, UK
Bin Li, Soochow University, China

Managing Editors

Ronghua Yao, **Weihua Xu**

Editorial Board Members*

Dafna Benayahu

Tel Aviv University, Israel

Liming Bian

The Chinese University of Hong Kong, China

Xiaofeng Chen

South China University of Technology, China

Di Chen

Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China

Jianjun Cheng

University of Illinois at Urbana Champaign, USA

Mu Cui

Xi'an Medical University, China

Jan Czernuszka

University of Oxford, UK

Xuliang Deng

Peking University, China

Zhenfeng Duan

University of California, USA

Qingling Feng

Tsinghua University, China

Xiaodong Guo

Huazhong University of Science and Technology, China

Tongchuan He

University of Chicago, USA

Francis J Hornicek

University of California, USA

Xinming Li

Soochow University, China

Gang Li

The Chinese University of Hong Kong, China

Jun Li

National University of Singapore, Singapore

Chaorong Liu

University College London, UK

Chuanju Liu

New York University, USA

Xia Lou

Curtin University, Australia

Peter X Ma

University of Michigan, USA

Zhengwei Mao

Zhejiang University, China

Haiquan Mao

Johns Hopkins University, USA

Shengli Mi

Tsinghua University, China

Christopher Mow

Stanford University, USA

Joachim Miguel Antunes

Correia de Oliveira

University of Minho, Portugal

Ming Pei

West Virginia University, USA

Ling Qin

The Chinese University of Hong Kong, China

Ling Qin

University of Pennsylvania, USA

Daping Quan

Sun Yat-sen University, China

Will Shu

University of Strathclyde, UK

Wei Sun

Tsinghua University, China

Guoming Sun

Hebei University, China

Wei Tong

Huazhong University of Science and Technology, China

Krasimir Vasilev

University of South Australia, Australia

Ying Wan

Huazhong University of Science and Technology, China

Lin Wang

Huazhong University of Science and Technology, China

Yunbing Wang

Sichuan University, China

Bing Wang

University of Pittsburgh, USA

Haili Wang

Heidelberg University, Germany

Yin Xiao

Queensland University of Technology, Australia

Jiake Xu

University of Western Australia, Australia

Weihua Xu

Huazhong University of Science and Technology, China

Charlie Yang

University of Colorado School of Medicine, USA

Kelvin Yeung

The University of Hong Kong, China

Keqin Zhang

Soochow University, China

Shengmin Zhang

Huazhong University of Science and Technology, China

Zhiyong Zhang

Guangzhou Medical University, China

Yeja Zhang

University of Pennsylvania, USA

Yuanyuan Zhang

Wake Forest University, USA

Xiaojing Zheng

University of Pittsburgh, USA

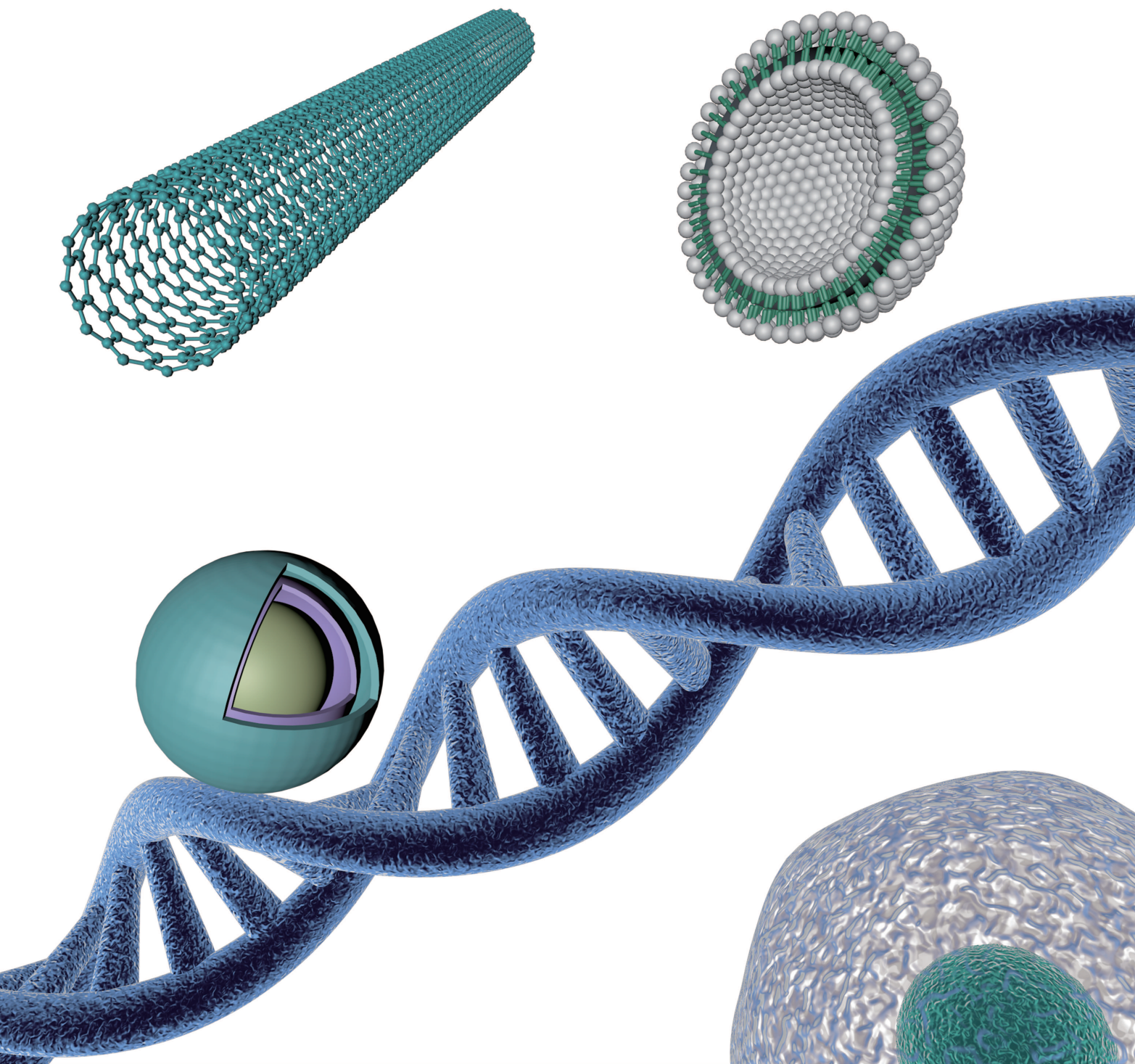
Zhixue Zhu

Zimmer Biomet Inc., USA

(*Arranged vertically in alphabetical order by their last name)

Biomaterials Translational

*The new vehicle of translational medicine:
www.biomat-trans.com*



submit your best research at
www.editorialmanager.com/biomater_trans/

ISSN 2096-112X



9 772096 112219

Biomaterials Translational

CONTENTS Quarterly Established in December 2020. Volume 2, Issue 1 March 28, 2021

SPECIAL ISSUE

1 Using biomaterials research to address the challenges raised by the COVID-19 pandemic

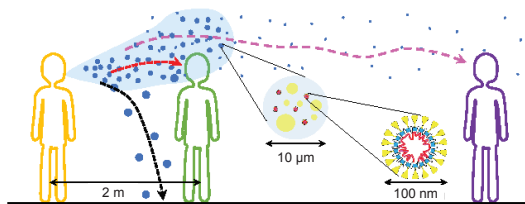
Qian Wang

3 Development of personal protective equipment for the COVID-19 pandemic in Thailand and technical aspects of testing gown materials

Visarut Buranasudja, Anongnat Somwangthanaroj, Suched Likitlersuang, Tirawat Boonyatee, Chartchalerm Isarankura-Na-Ayudhya, Jittima Amie Luckanagul

10 Physicochemical properties of respiratory droplets and their role in COVID-19 pandemics: a critical review

Ting Ge, Shengfeng Cheng

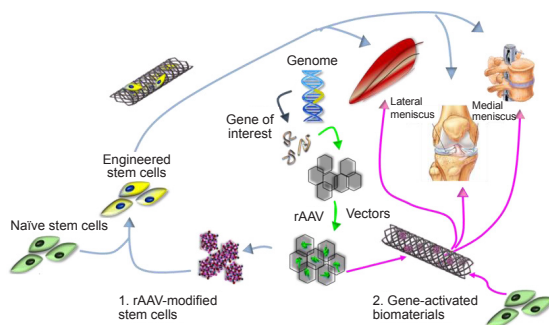


The coronavirus causing COVID-19 relies on respiratory droplets as the main carrier for its transmission.

Understanding the physical characteristics of respiratory droplets and their fate after being released into air plays a crucial role in helping develop mitigating measures and policies to fight the ongoing pandemic that plagues the world.

19 Recombinant adeno-associated virus-based gene therapy combined with tissue engineering for musculoskeletal regenerative medicine

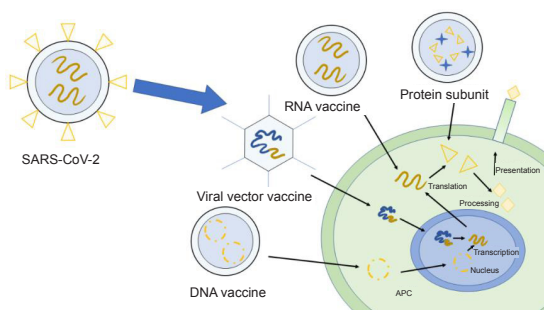
Yiqing Wang, Xiangyu Chu, Bing Wang



A schematic diagram illustrating recombinant adeno-associated viral (rAAV)-based gene therapy combined with a tissue-engineered biomaterial scaffold. rAAV-modified stem cells and gene-activated biomaterials can be applied to bone, vertebral disc, cartilage or muscle to treat multiple musculoskeletal disorders.

30 A biomaterials viewpoint for the 2020 SARS-CoV-2 vaccine development

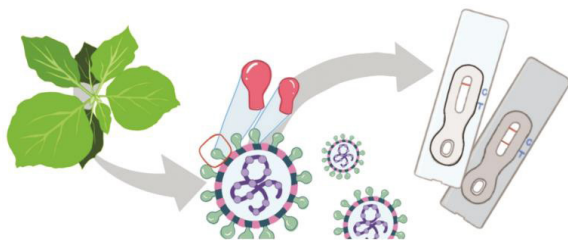
Isak Jatoi, Jingyu Fan



Four vaccine types derived from the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus are depicted, namely, DNA-based, viral vector, RNA-based, and protein subunit vaccines. Vaccine uptake, processing, and presentation by an antigen-presenting cell (APC) are also illustrated for these four vaccine mechanisms.

43 Plant-produced recombinant SARS-CoV-2 receptor-binding domain; an economical, scalable biomaterial source for COVID-19 diagnosis

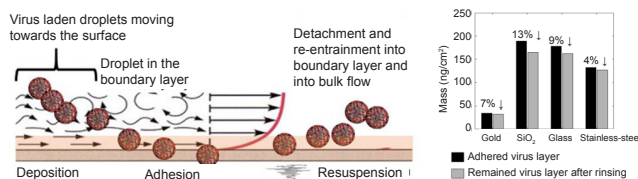
Kaewta Rattanapisit, Gorawit Yusakul, Balamurugan Shanmugaraj, Kittinop Kittirotruji, Phassorn Suwatsrisakul, Eakachai Prompetchara, Suthira Taychakhoonavud, Waranyoo Phoolcharoen



Plant-produced recombinant severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) receptor-binding domain (RBD) was used to develop a lateral flow immunoassay strip (LFIA) for detecting IgM/IgG antibodies.

50 Fate and transport of enveloped viruses in indoor built spaces – through understanding vaccinia virus and surface interactions

Dahae Seong, Monchupa Kingsak, Yuan Lin, Qian Wang, Shamia Hoque

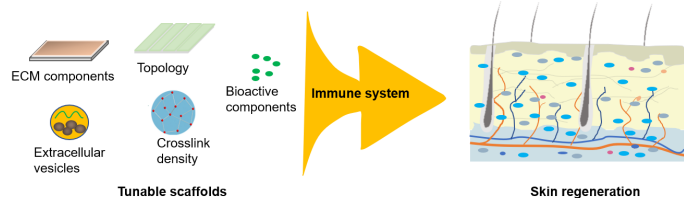


To limit transmission due to infectious droplets we must understand, “What factors control the transport, deposition, adhesion, and persistence of pathogens indoors?” The pandemic has reinforced the necessity of establishing baseline information on how viruses under indoor environmental conditions optimize survivability and transmission. Virus-surface interactions investigations using vaccinia virus sheds light on part of the picture.

REVIEWS

61 Engineering immune-responsive biomaterials for skin regeneration

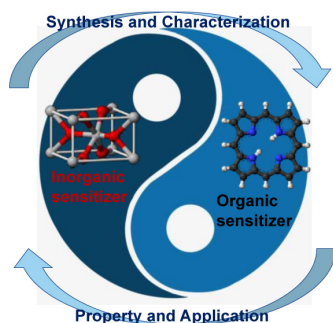
Pingli Wu, Yangyang Liang, Guoming Sun



The immune system plays significant roles in tissue engineering and regenerative medicine. The immunomodulatory potential of biomaterial scaffolds can be achieved by tailoring their chemical, physical and biological properties. Engineering immune-responsive pro-regenerative biomaterial scaffolds would greatly advance cutaneous wound healing.

72 Development of porphyrin and titanium dioxide sonosensitizers for sonodynamic cancer therapy

Xiangyu Deng, Zengwu Shao, Yanli Zhao



This review article highlights representative research progress on the development of porphyrin and titanium dioxide sonosensitizers for sonodynamic cancer therapy. These sonosensitizers are rationally designed according to inherent characteristics of the tumour microenvironment in order to achieve efficient therapeutic outcome, demonstrating their promising application potential in the cancer treatment.