

Nanotechnology in Medicine III: Enabling Next Generation Therapies

Calabria, Italy
15-20 May 2022

ISBN: 978-1-7138-8702-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2022) by Engineering Conferences International
All rights reserved.

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact Engineering Conferences International
at the address below.

Engineering Conferences International
32 Broadway, Suite 314
New York, NY 10004
USA

Phone: (212) 514-6760

Fax: (212) 514-6030

info@engconfintl.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Monday, May 16, 2022

07:30 - 09:00 Breakfast buffet

Session 1: Organs-on-chips to enable nanotherapies

Session Chair: Kacey Ronaldson-Bouchard, Columbia University, USA

Nanotechnology promises to transform the way we treat diseases. Despite the enormous promise, only a few therapies have reached the clinic. Less than 10% of systemically injected nanoparticles reach the intended target despite very robust targeting efforts. The fundamental understanding of the factors that lead to decreased bioavailability, such as serum protein adhesion, nanoparticle aggregation, permeability across tissue barriers and transfer through the intracellular and extracellular routes are limited. In this session we will explore how the field of organ-on-a-chip engineering can improve fundamental understanding required for development of new and effective nanotherapies.

09:15 - 10:00

KEYNOTE

Microscale technologies to decode EV-mediated cell behavior

Elisa Cimetta, University of Padova, Italy

10:00 - 10:20

Selected talk

Vasculature-on-a-chip platform with innate immunity enables identification of angiopoietin-1 derived peptide as a therapeutic for SARS-CoV-2 induced inflammation

Rick Xing Ze Lu, University of Toronto, Canada

12

10:20 - 10:40

Selected talk

Microfluidic spinning of topographical hollow fibers for the development of a 3D functional glomerulus in vitro

Chuan Liu, University of Toronto, Canada

10

10:40 - 11:10

Coffee break

Sponsored by Nortis, Inc.

11:10 - 11:30

Invited talk

Changes in extracellular matrix in failing human non-ischemic and ischemic hearts with mechanical unloading

Yimu Zhao, University of Toronto, Canada

11:30 – 12:15

KEYNOTE

Advancing preclinical *in vitro* pulmonary models for ventilation and Inhalation assays

Josue Sznitman, Technion, Israel

12:30 - 14:30

Lunch

Monday, May 16, 2022 (continued)

Session 2: Mechanical environment in health and diseases

Session Chair: Lola Eniola-Adefeso, University of Michigan, USA

Overwhelming evidence is mounting that bio-mechanical cues act in concert with well-known biochemical cues to regulate fundamental physiological process throughout the lifecycle of cells and tissues. Bio-mechanical interactions between cells and tissues are therefore attracting intense attention in broad biomedical research fields, and this session will focus on implications for health and diseases.

14:30 - 15:15

KEYNOTE

Collective forces and migration during tissue development and invasion

Timo Betz, University of Göttingen, Germany

15:15 - 15:35

Invited talk

Mechano-evolution and drug resistance in compact populations

Jona Kayser, Max-Planck-Institute for the Science of Light, Erlangen, Germany

15:35 - 15:55

Invited talk

Untangling the pro-fibrotic loop in pulmonary fibrosis: Synergy between substrate stiffness and soluble factors promotes alternative activation of macrophages

Catherine Fromen, University of Delaware, USA

15:55 - 16:25

Coffee break

16:25 - 16:45

Selected talk

Interstitial photothermal therapy generates durable treatment responses in neuroblastoma

Debbie Ledezma, George Washington University, USA

8

16:45 - 17:05

Selected talk

Liquid co-polymers as biodegradable surgical sealant

Neta Shimony, Technion, Israel

9

17:05 - 17:50

KEYNOTE

Cellular senescence in neuroinflammation

Shyni Varghese, Duke University, USA

18:00 - 19:30

Social Hour

19:30 - 21:00

Dinner

Tuesday, May 17, 2022

07:30 - 09:00 Breakfast buffet

Session 3: Nanotechnology in drug delivery, imaging and regenerative medicine

Session chair: Kaushal Rege, Arizona State University, USA

The fields of drug delivery, imaging and regenerative medicine all face challenges that can be addressed using nano techniques. This session will highlight applications of nanotechnology in driving advances in therapeutic areas that require the use of drugs and cell-based therapies. It will also highlight new powerful imaging techniques driven by nano-phenomena.

09:15 – 10:00

KEYNOTE

Targeted in vivo drug delivery with focused ultrasound

Naomi Matsuura, University of Toronto, Canada

10:00 – 10:20

Selected talk

Benchside-to-Bedside translation of novel targets for regulating blood clots in man

Michael Holinstat, University of Michigan, USA

2

10:20 - 10:40

Selected talk

Photothermal nanoparticle-based approaches to designing immunoengineered therapies for cancer

Rohan Fernandez, George Washington University, USA

11

10:40 - 11:10

Coffee break

11:10 - 11:30

Selected talk

Elastomeric droplet generation of vascularized cardiac spheroids for the use of high-throughput drugs screening

Jennifer Kieda, University of Toronto, Canada

5

11:30- 12:15

KEYNOTE

Diffusion, disorder and dynamics in the nuclear pore complex

Roderick Lim, Biozentrum, University of Basel, Switzerland

12:30 - 13:30

Lunch at the hotel

13:30 - 18:30

Excursion to the towns of Belvedere and Diamante
(included in registration for all conference participants)

19:00

Dinner at the Hotel

Wednesday, May 18, 2022

07:30 - 09:00 Breakfast buffet

Session 4: Advances in organ-on-a-chip engineering

Session Chair: Roger Kamm, MIT, USA

Recent advances in stem cell biology and microfabrication, enable us to develop on-chip models of human tissues. With the emergence of induced pluripotent stem cells it is now possible to obtain millions of human cells in an ethical manner from adults. It is possible for us to create microfabricated 3D models and on-chip systems that recapitulate key physiological functions of target organs. These organ-on-a-chip models are turning into indispensable tools to study nanoparticle toxicity, distribution in body-on-a-chip models and translocation across tissue barriers. This session will highlight the latest developments in organ-on-a-chip systems.

09:15 - 10:00

KEYNOTE

Recapitulating Complex Human Tissues using organ-on-chip and organoid Technologies

Peter Loskill, University of Tübingen, Germany

10:00 - 10:20

Selected talk

Advanced Imaging and Analysis Applications in Organ-on-Chip Technology

Sepand Bafti, Nortis, USA

10:20 - 10:40

Invited talk

Multi-organ platform with tissue-specific niches linked by vascular flow for studies of systemic disease.

Kacey Ronaldson-Bouchard, Columbia University, USA

10:40 - 11:10

Coffee break

11:10 – 11:30

Selected talk

A microfluidic architecture with multidirectional diffusion for modelling the stromal compartment of pancreatic ductal adenocarcinoma

Michael Mohan, University of Toronto, Canada

1

11:30 - 12:15

KEYNOTE

Personalizing the treatment of Parkinson's disease using a multi-sensor integrated midbrain organoid-on-a-chip platform

Peter Ertl, Vienna University of Technology, Austria

12:15 - 14:30

Lunch

Wednesday, May 18, 2022 (continued)

14:30 - 15:45

Session 5: Panel Discussion: Advancing equity, diversity and inclusion

Session Chair: Milica Radisic, University of Toronto

Science is truly an international discipline. However, in full professor positions, and in leadership positions that racial, ethnic and international diversity is clearly lacking. This is a barrier for entry of minority trainees to those positions. Looking up from the undergraduate and PhD positions, they do not necessarily see any role models that they could identify with in the current environment. It is for this reason that we are focusing on a small conference where trainees from diverse backgrounds, could directly network one-to-one with leading scientists who, and who are like them: visible minorities, scientists with visible disabilities, women scientists, etc.

Panelists:

Lola Eniola-Adefeso, University of Michigan, USA

Victor Shahin, University of Munster, Germany

Catherine Fromen, University of Delaware, USA

Roger Kamm, MIT, USA

16:00 - 18:15

Session 6: Nano-enabled next generation functional materials

Session Chair: Stefaan De Smedt, Ghent University, Belgium

Besides drug delivery, nanotechnology enables development of new and unique materials. This session will highlight the latest developments in functional materials designed to convey unique electrical and mechanical properties for therapeutic and regenerative medicine applications.

16:00 - 16:45

KEYNOTE

Fluorinated nanomaterials as powerful bioimaging tools in medicine

Francesca Baldelli Bombelli, Politecnico Milano, Italy

6

16:45 - 17:05

Invited talk

High-throughput liver microenvironment engineering

Gregory Underhill, University of Illinois at Urbana-Champaign, USA

17:05 - 17:25

Invited talk

Extracellular vesicles as next-generation nanomaterials

Anika Nagelkreke, University of Groningen, Netherlands

17:25 - 17:45

Stretch break

17:45 - 18:30

KEYNOTE

We don't talk about neutrophils: Novel particle-based approach to immunomodulation in acute inflammatory diseases.

Lola Eniola-Adefeso, University of Michigan, USA

Wednesday, May 18, 2022 (continued)

- | | |
|---------------|--|
| 18:30 – 18:50 | Selected talk
Heart-on-a-chip Platform to Model Cardiac Sars-cov-2 Pathogenesis and Therapeutic Screening
Qinghua Wu, University of Toronto, Canada |
| 18:50 - 19:30 | Sponsor Exhibits / Social Hour |
| 19:30 - 21:00 | Dinner |

Thursday, May 19, 2022

07:30 - 09:00 Breakfast buffet

Session 7: Nanotechnology for next generation therapies

Session Chair: Josue Sznitman, Technion Israel Institute of Technology, Israel

In recent years, the fast-paced nanotechnological advance has generated entirely novel strategies for the effective treatment of various challenging diseases that resisted the classical treatment approaches. Indeed, the tremendous development in nanotechnology for next generation therapies proved to be the game-changer in the devastating global pandemic. This session will focus on novel nanotechnology-based therapies and nano-enabled functional materials.

09:15 - 10:00

KEYNOTE

Photoablation of human vitreous opacities by light-induced vapor nanobubbles

Stefaan De Smedt, Ghent University, Belgium

10:00 - 10:20

Invited

Nanomaterials for light-activated tissue repair and wound healing

Kaushal Rege, Arizona State University, USA

10:20 – 10:40

Selected talk

Collagen-mimetic peptides for delivery of therapeutics in chronic wounds healing application

Jeonming Hwang, University of Delaware

3

10:40 - 11:10

Coffee break

11:10 - 11:30

Selected talk

Implications of the nuclear pore barrier for non-small cell lung cancer malignancy and therapy

Silvio Terra Stefanello, University of Münster, Germany

7

11:30 - 12:15

KEYNOTE

Materials and devices for stretchable and self-healing bioelectronics

Fabio Cicoira, Polytechnique Montréal, Canada

12:30 - 14:30

Lunch

14:30 - 16:30

Free time to enjoy beach, golf course and the surrounding area

Thursday, May 19, 2022 (continued)

Session 8: Organ-on-chip industrial applications

Session Chair: Peter Loskill, Fraunhofer IGB, Stuttgart, Germany

Organ-on-a-chip technologies are gaining significant traction in industrial applications starting from toxicity testing, studies of permeability across the epithelial barriers all the way to disease modelling. This session will highlight latest developments and use cases of organ-on-a-chip technologies in industrial applications.

16:30 - 17:15

KEYNOTE

Novel human cell models in drug development: How 3D, organoids & organs on chips can improve and renew current paths - and our vision for the future

Adrian Roth, Principal Scientific Director, Roche, Basel, Switzerland

17:15 - 17:35

Selected talk

E-FLOAT: Extractable floating liquid gel-based organ-on-a-chip for airway tissue modeling under airflow

4

Siwan Park, University of Toronto, Canada

17:35 – 18:20

KEYNOTE

Industry perspective on the future of organ-on-chip applications

Thomas Neuman, Nortis, USA

18:20 – 19:00

Stretch break

19:00 - 20:00

CLOSING PLENARY

Microphysiological models of neurological disease

Roger Dale Kamm, MIT, USA

20:00 - 22:00

Conference Dinner and Presentation Awards