

Engineering Conferences International

**ECI Digital Archives**

---

Nanotechnology In Medicine III: Enabling Next  
Generation Therapies

Proceedings

---

5-15-2022

## **Nanotechnology in Medicine III: Enabling Next Generation Therapies**

Milica Radisic

Victor Shahin

Millicent Sullivan

Josué Sznitman

Lola Eniola-Adefeso

Follow this and additional works at: [https://dc.engconfintl.org/nanotech\\_med\\_iii](https://dc.engconfintl.org/nanotech_med_iii)

---

*Program*

**Nanotechnology in Medicine III:  
Enabling Next Generation Therapies**

**May 15 - 20, 2022**

**Grand Hotel San Michele, Cetraro (Calabria), Italy**

**Chairs**

**Milica Radisic**

University of Toronto, Canada

**Victor Shahin**

University of Münster, Germany

**Co-Chairs**

**Millicent Sullivan**

University of Delaware, USA

**Josué Sznitman**

Technion, Israel

**Lola Eniola-Adefeso**

University of Michigan, USA



**Engineering Conferences International**

**32 Broadway, Suite 314 - New York, NY 10004, USA**

**Phone: 1 - 212 - 514 - 6760**

**[www.engconfintl.org](http://www.engconfintl.org) – [info@engconfintl.org](mailto:info@engconfintl.org)**

**Grand Hotel San Michele**

**Contrada BOSCO 30**

**87022 - Cetraro (CS), Italy**

**Phone: +39-0982-91012**

**Email: [sanmichele@sanmichele.it](mailto:sanmichele@sanmichele.it)**

Engineering Conferences International (ECI) is a not-for-profit global engineering conferences program, originally established in 1962, that provides opportunities for the exploration of problems and issues of concern to engineers and scientists from many disciplines.

#### ECI BOARD MEMBERS

Barry C. Buckland, President  
Mike Betenbaugh  
Joye Bramble  
Nick Clesceri  
Chetan Goudar  
Peter Gray  
Michael King  
Raymond McCabe  
Eugene Schaefer  
P. Somasundaran

Chair of ECI Conferences Committee: Nick Clesceri

ECI Technical Liaison for this conference: Joye Bramble

ECI Executive Director: Barbara K. Hickernell

ECI Associate Director: Kevin M. Korpics

**Previous conferences in this series:**

***Nanotechnology in Medicine: From Molecules to Humans***

**July 3-7, 2016**

**Hernstein, Austria**

*Conference Chairs:*

Lola Eniola-Adefeso (Department of Chemical Engineering, University of Michigan, USA)

Paolo Decuzzi (Italian Institute of Technology, Italy)

***Nanotechnology in Medicine II:***

***Bridging Translational in vitro and in vivo Interfaces***

**June 5-9, 2018**

**Grande Real Santa Eulalia Hotel, Albufeira, Portugal**

*Conference Chairs:*

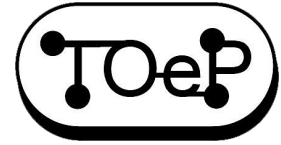
Millicent Sullivan

(Department of Chemical & Biomolecular Engineering, University of Delaware, USA)

Josué Sznitman

(Department of Biomedical Engineering, Technion-Israel Institute of Technology, Israel)

## Conference Sponsors



**BIOMEDICAL  
ENGINEERING**  
UNIVERSITY OF TORONTO

***Institute of Biomedical Engineering, University of Toronto***

***Nortis, Inc.***

***NSERC CREATE Training Program in Organ-on-a-Chip Engineering & Entrepreneurship***

***European Journal of Pharmaceutics***

***Medicine by Design Program, University of Toronto***

***ACS Publications: Nano Letters, ACS Nano, & Molecular Pharmaceutics***

***Biomicrofluidics (BMF)***

***Nanoscale Advances and Sensors and Diagnostics***

# MEDICINE by DESIGN

CONVERGING ON ENGINEERED SOLUTIONS  
FOR REGENERATIVE MEDICINE



A TOP GLOBAL  
RESEARCH UNIVERSITY  
IN THE WORLD'S MOST  
DIVERSE CITY



155+  
REGENERATIVE  
MEDICINE RESEARCHERS

900+  
GRADUATE STUDENTS  
AND POST-DOCTORAL  
FELLOWS

9 WORLD-CLASS  
PARTNER HOSPITALS,  
INCLUDING:



SickKids®



\$75-MILLION  
FUNDING FOR DISCOVERY,  
TRANSLATION AND  
COMMERCIALIZATION



\$114-MILLION  
GRANT FROM GOVERNMENT  
OF CANADA (2015–2023)

17  
NEW FACULTY



100+  
PROJECTS AT THE  
CONVERGENCE OF  
SCIENCE, ENGINEERING  
AND MEDICINE



UNIVERSITY OF  
TORONTO



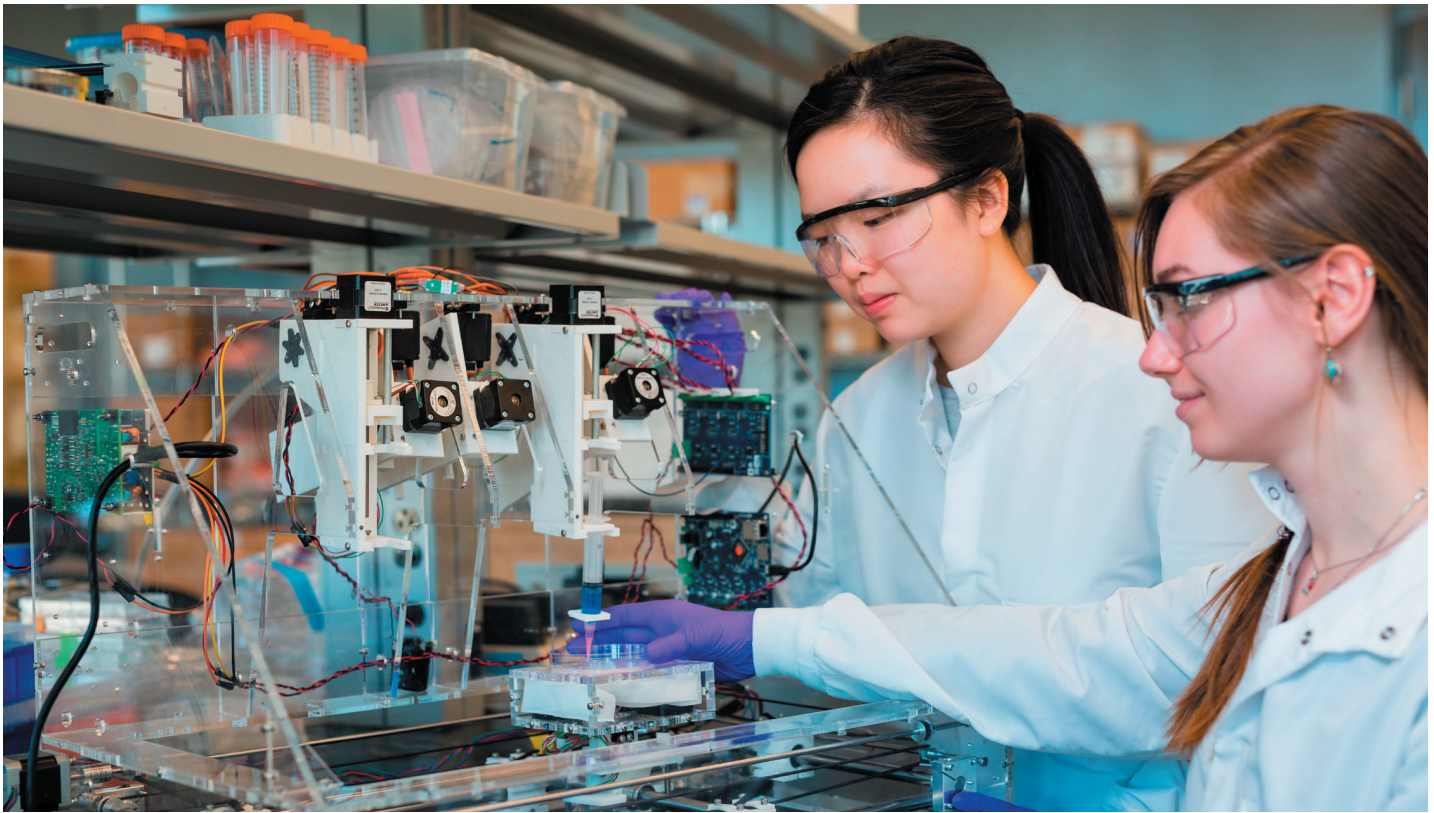
CANADA  
FIRST  
RESEARCH  
EXCELLENCE  
FUND

APOGÉE  
CANADA  
FONDS  
D'EXCELLENCE  
EN RECHERCHE



@Mbd\_UofT

[mbd.utoronto.ca](http://mbd.utoronto.ca)



# INSTITUTE OF BIOMEDICAL ENGINEERING

## UNIVERSITY OF TORONTO

The Institute of Biomedical Engineering (BME) at the University of Toronto is a multidisciplinary research community where investigators from engineering, medicine and dentistry collaborate to find innovative solutions for the most pressing health-care challenges in the world.

Located in the heart of Canada's largest health-care research network, we offer three graduate degrees to more than 300 students who receive training in biomedical and clinical engineering from more than 100 faculty members across numerous academic partners and hospitals.

**60**

Years of History  
(Oldest in Canada)

**100+**

Faculty Members

**31**

Academic & Hos-  
pital Partners

**350+**

Graduate Student  
Population

**47%**

Women Graduate  
Students

**60%**

PhD Students

**170+**

Annual Publi-  
cations

**\$9**

Annual Research  
Funding (Million)

**#1**

CIHR funding  
in Engineering

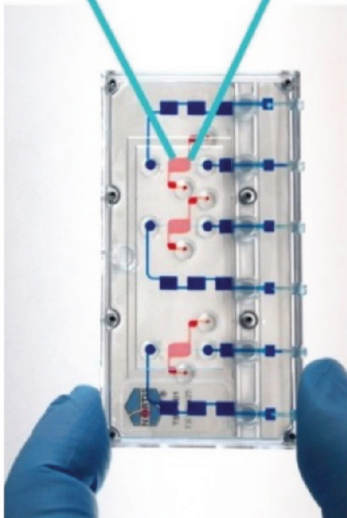
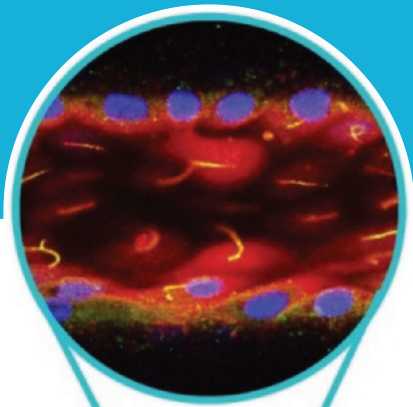


Institute of Biomedical Engineering  
**UNIVERSITY OF TORONTO**

[contact@utoronto.ca](mailto:contact@utoronto.ca)  
[bme.utoronto.ca](http://bme.utoronto.ca) | [discover.bme.utoronto.ca](http://discover.bme.utoronto.ca)



# Better Insights from your *in vitro* Drug Toxicity Testing



## ParVivo™ Human Kidney Proximal Tubule Chip

- Supplied with preformed, functional 3D proximal tubules ready for immediate use
- Extensively characterized and QC tested for reliable and reproducible performance
- Easy end-point detection using confocal imaging, effluent collection or cell recovery for genomic analysis

Each batch of ParVivo™ Kidney Chips is QC tested for complete tubule formation, tubule health and integrity, matrix homogeneity and accurate perfusion. Upon receipt, the Chips can be immediately loaded and perfused on the ParVivo™ System where they will retain cell viability, functionality and 3D tissue morphology for at least 10 weeks.

Chip processing on the modular ParVivo™ System allows precise flow control and accurate delivery of test compounds, enabling the simultaneous assay of up to 108 kidney proximal tubules.

Nortis  
17280 Redmond-Woodinville Rd NE  
Woodinville, WA 98072

For inquiries, contact  
[info@nortisbio.com](mailto:info@nortisbio.com)

[www.NortisBio.com](http://www.NortisBio.com)





## European Journal of Pharmaceutical Sciences Official Journal of the European Federation for Pharmaceutical Sciences (EUFEPS)



ELSEVIER

- Immediate, permanent and free access to your paper on publication
- With this journal indexed in 13 international databases, your published article can be read and cited by researchers worldwide
- Impact Factor\* of 4.384, ranking it 86 out of 275 journals in its field. \*Journal Citation Reports®
- Our international editorial board represents some of the leading institutions around the globe
- European Journal of Pharmaceutical Sciences has an experienced editorial board led by Martin Brandl

**OPEN ACCESS PER 1 JANUARY 2022!**

European Journal of Pharmaceutical Sciences is a peer reviewed, open access Journal. See the journal homepage for details: [www.elsevier.com/locate/ejps](http://www.elsevier.com/locate/ejps)

## **Sunday, May 15, 2022**

16:00 - 17:45	Conference Check-in
17:45 – 18:00	Conference Introduction Milica Radisic, University of Toronto, Canada Victor Shahin, University of Münster, Germany
18:00 - 19:00	<b><u>OPENING PLENARY</u></b> <b>Artificially intelligent nanosensors for personalized diagnosis and monitoring</b> Hossam Haick, LNBD Technion, Haifa, Israel
19:00 - 20:00	Opening Reception
20:00 - 21:30	Dinner
21:30 – 22:30	Social Hour

### **NOTES**

- *Please wear your mask when not actively eating or drinking.*
- *Technical Sessions will be held in the Conference Center.*
- *Meals*  
*Breakfast in the breakfast room and outside deck;*  
*Lunches – either at the beach or at the hotel – one’s choice. The hotel staff would like to get an idea of how many will be eating at the beach area. The beach eating area is covered and is quite close to the sea. One takes an elevator to get to the beach area and back. Once there, it is quite lovely and people hesitate to come back promptly. Dinners are either in the dining room or outside patio (depending on what they are serving). It is not a large hotel and everything is close.*
- *Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before).*
- *Speakers – Please leave at least 3-5 minutes for questions and discussion.*
- *Please do not smoke at any conference functions.*
- *Turn your mobile telephones to vibrate or off during technical sessions.*
- *After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.*
- *Audiotaping, videotaping and photography of presentations are prohibited*

## **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

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

10:40 - 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

16:45 - 17:05

Selected talk

**Liquid co-polymers as biodegradable surgical sealant**

Neta Shimony, Technion, Israel

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

10:20 - 10:40

Selected talk

#### **Photothermal nanoparticle-based approaches to designing immunoengineered therapies for cancer**

Rohan Fernandez, George Washington University, USA

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

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

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

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<br><b>Heart-on-a-chip Platform to Model Cardiac Sars-cov-2 Pathogenesis and Therapeutic Screening</b><br>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

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

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**

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

**Friday, May 20, 2022**

07:30 - 09:00      Breakfast buffet

Departures