



# Organs- and Tissues-on-Chips

April 8–12, 2018 | Big Sky Resort | Big Sky, Montana | USA

## Scientific Organizers:

**Christopher P. Austin**, National Institutes of Health, USA

**Danilo Tagle**, NCATS, National Institutes of Health, USA

**Christine L. Mummery**, Leiden University Medical Center, Netherlands

**Brian R. Berridge**, GlaxoSmithKline, USA

*More than 30% of promising medications have failed in human clinical trials because they are determined to be toxic despite promising pre-clinical studies in 2-D cell culture and animal models. Another 60% fail due to lack of efficacy. Consequently, though several thousand diseases affect humans, only about 500 have approved treatments. However, with the growing understanding of human biology, along with increased availability of innovative technologies, there is now an unprecedented opportunity to translate scientific discoveries more efficiently into new, more effective and safer health interventions. Organs- or Tissues-on-Chips are innovative, alternative approaches that would enable early indications and potentially more reliable readouts of toxicity and efficacy. These microfabricated devices recapitulate the multicellular architectures, tissue-tissue interfaces, physicochemical microenvironments, vascular perfusion and innervation, producing in essence microphysiological systems that mimic human tissue and organ functionality not possible with conventional 2D or 3D culture systems. Through innovative biosensing and readout approaches, these devices employ high-resolution, real-time imaging and non-invasive analysis of biochemical, genetic and metabolic activities of living cells in a functional tissue and organ context. This technology has great potential to advance the study of tissue development, organ physiology and disease etiology. In the context of drug discovery and development, it should be especially valuable for the study of molecular mechanisms of action, prioritization of lead candidates, toxicity testing and biomarker identification. These microfabricated devices have also proven to be useful for modeling human diseases. The conference will touch on ongoing efforts and various applications of tissue-on-chips technology to studies in precision medicine, environmental exposures, reproduction and development, cancer and for use at the International Space Station.*


## Session Topics:

- Organs-on-Chips in Drug Development
- Integrated Organs-on-Chips
- Organs-on-Chips for Disease Modeling I & II
- Other Opportunities: 1) Tissue-on-Chips for Translational Research in Space; 2) Environmental Health
- Commercializing Tissue Chip Technologies
- Perspectives from Regulatory Agencies and the Pharmaceutical Industry
- Validating Tissue Chips  
*plus two workshops*

**Scholarship Application & Discounted Abstract Deadline: December 6, 2017**

**Abstract Deadline: January 9, 2018**

**Discounted Registration Deadline: February 6, 2018**



Note: Scholarships are available for graduate students and postdoctoral fellows and are awarded based on the abstract submitted. Submitting an abstract is an excellent opportunity to gain exposure for your work. Abstracts submitted by the abstract deadline will also be considered for short talks on the program.

Upper image of lung tissue on a chip courtesy of National Center for Advancing Translational Sciences, NIH

Meeting Hashtag: #KSchips

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# KEYSTONE SYMPOSIA

on Molecular and Cellular Biology

## Organs- and Tissues-on-Chips (D1)

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### SUNDAY, APRIL 8

#### Arrival and Registration

### MONDAY, APRIL 9

#### Welcome and Keynote Address

**Christopher P. Austin**, National Institutes of Health, USA  
*Overview of Organs-on-Chips in Drug Development for Safety, Toxicity and Efficacy Testing*

#### Organs-on-Chips in Drug Development

**D. Lansing Taylor**, University of Pittsburgh Drug Discovery Institute, USA

*Role of a Human Liver Microphysiology System as a Key Component of a Quantitative Systems Pharmacology Platform for Investigating Liver Disease Progression and Drug Discovery and Development*

**Christine L. Mummery**, Leiden University Medical Center, Netherlands  
*Cardiovascular Diseases and Drugs in Organ-on-Chip hiPSC Models*

**Jonathan Himmelfarb**, University of Washington, USA  
*A Human Kidney on a Chip for Disease Modeling and Toxicity Testing*

#### Short Talk(s) Chosen from Abstracts

#### Integrated Organs-on-Chips

**Gordana V. Vunjak-Novakovic**, Columbia University, USA  
*Human Multi-Tissue Platforms with Perfusable Vasculature*

**Donald E. Ingber**, Wyss Institute for Biologically Inspired Engineering at Harvard, USA

*DARPA Integrated 10-Organ System Using Microfluidic Platform*

**Linda G. Griffith**, Massachusetts Institute of Technology, USA  
*DARPA Integrated 10-Organ System Using a Microwell System*

#### Short Talk Chosen from Abstracts

#### Poster Session 1

### TUESDAY, APRIL 10

#### Organs-on-Chips for Disease Modeling I

**Kevin Kit Parker**, Harvard University, USA  
*Cardiomyocytes-on-Chips as Models for Barth Syndrome and Long QT*

**Nancy L. Allbritton**, University of North Carolina, Chapel Hill and North Carolina State University, USA  
*Intestinal Simulacra on a Microscale*

**Steven C. George**, University of California, Davis, USA  
*3D "Organ-on-a-Chip" Models of Atrial Conduction and Primary Human Cancer*

**George Truskey**, Duke University, USA  
*Microphysiological Systems Vascular Model of Progeria*

#### Organs-on-Chips for Disease Modeling II

**Helena Therese Hogberg**, Johns Hopkins Bloomberg School of Public Health, USA  
*3D Neuronal Microphysiology Systems and Neuronal Disease Models*

**Joanna Burdette**, University of Illinois at Chicago, USA  
*Reproductive Cycles in a Dish Engineered to Model PCOS*

**Kevin E. Healy**, University of California, Berkeley, USA  
*Microphysiological Systems for Drug Discovery, Disease Modeling, and Precision Medicine*

#### Short Talk Chosen from Abstracts

#### Poster Session 2

### WEDNESDAY, APRIL 11

#### Other Opportunities: 1) Tissue-on-Chips for Translational Research in Space 2) Environmental Health

**Rocky S. Tuan**, University of Pittsburgh School of Medicine, USA  
*Tissue Chip Modeling of Synovial Joint Physiology and Pathologies*

**Bruce R. Conklin**, Gladstone Institutes and UCSF, USA  
*CRISPR and Stem Cells: Disease Mechanism and Genome Surgery*

**Warren M. Casey**, NICEATM, NIEHS, National Institutes of Health, USA

*Tissue Chips for Chemical Safety Testing: "Build it and They Will Come" is Not a Viable Strategy*

**Richard S. Paules**, NIEHS, National Institutes of Health, USA  
*Tox21 Efforts in Improving Toxicology and Human Safety Assessment*

#### Short Talk(s) Chosen from Abstracts

#### Workshop 1

#### Short Talks Chosen from Abstracts

#### Commercializing Tissue Chips Technologies

**Geraldine A. Hamilton**, Emulate Inc., USA  
*Organs-on-Chips Technology: A Platform for Advancing Efficacy and Safety Testing in Drug Discovery and Development*

**Thomas Neumann**, Nortis, Inc., USA  
*How Organ-on-Chip Technologies will Revolutionize in-vitro Methods*

**Uwe Marx**, TissUse GmbH and Technische Universität Berlin, Germany

*Commercializing Integrated Multi-Organ Tissue Chips*

#### Short Talk Chosen from Abstracts

#### Poster Session 3

### THURSDAY, APRIL 12

#### Perspectives from Regulatory Agencies and Pharmaceutical Industry

**Donna Mendrick**, Food and Drug Administration, USA  
*FDA Perspectives on Tissues-on-Chips*

**Sonja Beken†**, European Medicines Agency, Federal Agency for Medicines and Health Products, Belgium  
*European Regulatory Agency Perspectives on Tissues-on-Chips*

**Adrian Roth**, F. Hoffmann-La Roche Ltd, Switzerland  
*Industry Perspective on Organ on a Chip Technology*

**Brian R. Berridge**, National Institute of Environmental Health Sciences, USA  
*Tissue Chips to Improve Clinical Translation and Reduce Late Stage Drug Development Attrition*

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### Short Talk(s) Chosen from Abstracts

#### Workshop 2

### Short Talks Chosen from Abstracts

#### Validating Tissue Chips

**Ivan Rusyn**, Texas A&M University, USA

*Tissue Chip Validation Center at Texas A&M University (Tex-Val Center)*

**Murat Cirit**, Massachusetts Institute of Technology, USA

*Quantitative Characterization of Tissue Chip Technologies*

**Mark E. Schurdak**, University of Pittsburgh, USA

*The Microphysiology Systems Database For Validation of Tissue Chip Organ Models*

#### Meeting Wrap-Up: Outcomes and Future Directions

**Danilo A. Tagle**, NCATS, National Institutes of Health, USA

*The NIH Tissue Chips for Drug Screening Program: What's on the Horizon for Tissues-on-Chips?*

### FRIDAY, APRIL 13

#### Departure