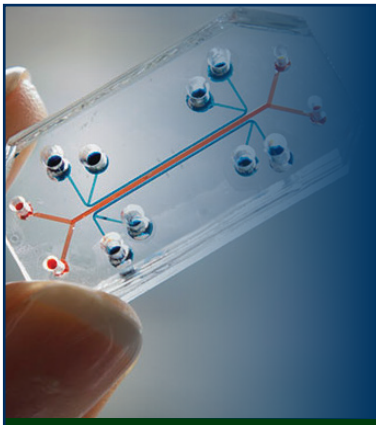

Organs- and Tissues-on-Chips

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, NIEHS, National Institutes of Health, 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)

April 8-12, 2018 • Big Sky Resort • Big Sky, Montana, USA

Scientific Organizers: Christopher P. Austin, Danilo Tagle, Christine L. Mummery and Brian R. Berridge

Sponsored by Merck & Co., Inc.

Abstract & Scholarship Deadline: December 6, 2017 / Abstract Deadline: January 9, 2018 / Discounted Registration Deadline: February 6, 2018

SUNDAY, APRIL 8

Arrival and Registration

MONDAY, APRIL 9

Welcome and Keynote Address

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

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

*Brian R. Berridge**, National Institute of Environmental Health Sciences, NIH, USA

*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

*Brian R. Berridge**, National Institute of Environmental Health Sciences, NIH, USA

*Kevin Kit Parker**, Harvard University, USA

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

Misti Ushio, TARA Biosystems, USA
Short Talk: BiowireTM II: A Commercial Platform for the Production and Functional Assessment of Adult-Like Engineered Human Cardiac Tissue

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

Integrated Organs-on-Chips

*Jason Ekert**, GlaxoSmithKline, USA

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

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

Olivier Frey, InSphero, Switzerland
Short Talk: Automating Multi-Tissue Microphysiological Systems Based on 3D Microtissues

Poster Session 1

TUESDAY, APRIL 10

Organs-on-Chips for Disease Modeling I

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

*Bruce R. Conklin**, Gladstone Institutes, USA

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

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

Megan Laura McCain, University of Southern California, USA
Short Talk: Engineering μMyocardium with Tunable Cell-Matrix and Cell-Cell Interactions for Cardiac Disease Modeling

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

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

Robert Barrett, Cedars-Sinai Medical Center, USA
Short Talk: Intestine-Chip: A New Model to Understand the Role of the Intestinal Epithelium in IBD by Combining Microengineering Technology and iPSC-Derived Human Intestinal Organoids

Organs-on-Chips for Disease Modeling II

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

*Clive N. Svendsen**, Cedars-Sinai Regenerative Medicine Institute, USA

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

Samuel Sances, Cedars-Sinai Medical Center, USA
Short Talk: Microphysiological Systems to Study Human Neurodegenerative Disease

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

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

Poster Session 2

WEDNESDAY, APRIL 11

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

*Gordana V. Vunjak-Novakovic**, Columbia University, USA

*Liz Warren**, CASIS, USA

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

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

Warren M. Casey, 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

Sreenivasa Ramaiahgari, National Toxicology Program of NIEHS, USA
Short Talk: Functional Characterization of Microplate Cultured Human and Rat 3D Hepatocyte Spheroids and Their Use with High-Throughput Transcriptomics (S1500+) in Toxicology Screening

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Workshop 1: Innovative Approaches, Designs, Readouts

*__Lorna Ewart__, AstraZeneca, UK

*__Steven C. George__, University of California, Davis, USA

Riccardo Barrile, Emulate Inc., USA
Organ-on-Chip Technology Recapitulates Thrombosis Induced by an Anti-CD154 Candidate Therapeutic Monoclonal Antibody

Stefano Da Sacco, University of Southern California, USA
Development of a Barrier-Free Glomerulus-on-a-Chip System as a Model to Study the Glomerular Filtration Barrier in vitro

Viktoras Frismantas, Wyss Institute for Biologically Inspired Engineering at Harvard University, USA
Modeling Drug- and Radiation-Induced Myelosuppression in a Vascularized Human Bone Marrow-on-a-Chip

Dhvanit I. Shah, Nationwide Children's Hospital, USA
Development of a Bioreactor Simulating Mechanosensation to Stimulate Hematopoietic Stem Cell Formation

Berend J. van Meer, Leiden University Medical Center, Netherlands
Generic and Simultaneous Optical Measurement Method of Electrophysiology, Calcium and Contractility for Heart-on-Chips in Response to Drugs and Disease

Remi Villenave, Emulate Inc., USA
A Micro-Engineered Airway Lung-Chip that Recapitulates Unique Features of Human Viral-Induced Exacerbation of Asthma

Ashutosh Agarwal, University of Miami, USA
Resealable, Optically Accessible, PDMS-Free Fluidic Platforms for Organs on Chips

Commercializing Tissue Chip Technologies

*__Ivan Rusyn__, Texas A&M University, USA

*__Murat Cirit__, Massachusetts Institute of Technology, USA

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 Universitat Berlin, Germany
Commercializing Integrated Multi-Organ Tissue Chips

Jos Joore, Mimetas, Netherlands
Short Talk: Commercializing High-Throughput Organ-on-a-Chip Systems for Early Implementation into Therapeutic Development

Poster Session 3

THURSDAY, APRIL 12

Perspectives from Regulatory Agencies and the Pharmaceutical Industry

*__Mark E. Schurdak__, University of Pittsburgh, USA

*__Tracy C. MacGill__, U.S. Food and Drug Administration, USA

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

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

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

Amy Pointon, AstraZeneca, UK
Short Talk: The Value of Functional Multi-Organ Microphysiological Systems to Cardiovascular Safety

Andrew Schwab, Environmental Protection Agency, USA
Short Talk: Development of a Human Neurovascular Unit Organotypic Systems Model

Elizabeth Baker, Physicians Committee for Responsible Medicine, USA
Short Talk: Preclinical Innovation and Patient Safety: Supporting Human-Based Science Through Advances in Law, Policy, Education and Training

Lorna Ewart, AstraZeneca, UK
Short Talk: Liver-Chip and Spheroids as Systems to Determine Hepatic Safety and Metabolism

Workshop 2: Tissue Chips for Personalized Medicine

*__Kevin E. Healy__, University of California, Berkeley, USA

*__Donald E. Ingber__, Wyss Institute for Biologically Inspired Engineering at Harvard, USA

Zongyou Guo, Columbia University, USA
Atopic Cytokines IL4/13 Perturb iPSC-Derived Itch-Specific Sensory Neurons

Peter Loskill, Fraunhofer Institute for Interfacial Engineering and Biotechnology, Germany
Merging High-Content and High-Throughput Screening: Microphysiological Organ-on-a-Chip Systems Integrating Human Retinal, Cardiac and Adipose Tissue

Chris P. Miller, University of Washington, USA
A 3D Human Renal Cell Carcinoma on a Chip for the Study of Tumor Angiogenesis

Kasper Renggli, ETH Zürich, Switzerland
Leukemia on Chip – Flow- and Metabolism-Based Microphysiological Multi-Tissue System for Patient-Derived Liquid Biopsies

Gad David Vatine, Ben Gurion University, Israel
Microphysiological Human iPSC-Based Isogenic Blood Brain Barrier-on-Chip Platform for Personalized Predictive Medicine

Hee-Gyeong Yi, POSTECH, South Korea
3D Cell-Printed Glioblastoma-on-a-Chip for Personalized Medicine

Leigh Joan Atchison, Duke University, USA
An Induced Pluripotent Stem Cell-Derived Tissue-Engineered Blood Vessel to Study Hutchinson-Gilford Progeria Syndrome

Validating Tissue Chips

*__Peter Loskill__, Fraunhofer Institute for Interfacial Engineering and Biotechnology, Germany

*__Lucie Low__, National Institutes of Health, USA

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 Assessment 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

Danilo A. Tagle, NCATS, National Institutes of Health, USA
The NIH Tissue Chips for Drug Screening Program: Current and Future Directions

FRIDAY, APRIL 13

Departure