

AGENDA

The Potential of the Tissue Chip for Environmental Health Studies

JULY 21–22*, 2014 ■ MONDAY ~8:30–5:00, TUESDAY 8:30–NOON

NATIONAL ACADEMY OF SCIENCES, ROOM 120 ■ 2101 CONSTITUTION AVENUE, NW ■ WASHINGTON, DC

THIS MEETING WILL BE WEBCAST

Human tissue chips are touted as offering a more human-representative alternative to animal models, while overcoming limitations associated with *in vitro* systems— but concerns remain about the limitations of these emerging model systems. A tissue chip, also referred to as a biological platform or an organ-on-a-chip, is a structure seeded with multiple cell types to simulate the architecture and function of whole organs. They are built using recent advances in nanotechnology,

micro-engineering, systems biology, and stem cell technology.

This meeting will examine the state of development and use of tissue chips, and explore the promises and limitations of their use in environmental health research and regulatory contexts.

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MONDAY, JULY 22, 8:30AM–5:00PM

SESSION 1 POTENTIAL OF THE TISSUE CHIP

- 8:30 **Welcome**—William Farland[†], *Colorado State University*, and John Balbus, *National Institute of Environmental Health Sciences (NIEHS)*
- 8:40 **Opening Remarks: What Do We Mean by “Tissue Chip”**—Martin Stephens[†], *Johns Hopkins University*
- 8:50 **The Promise of the Tissue Chip**—Anthony Bahinski, *Wyss Institute for Biologically Inspired Engineering*
- 9:20 **Humanizing the Tissue Chip: Use of Stem Cells to Develop Biological Platforms**—Kyle Kolaja, *Cellular Dynamics International*

* The committee and government liaison group will meet Tuesday, July 22, 12:30pm–3:00pm.

[†] indicates a member of the Standing Committee on Use of Emerging Science for Environmental Health Decisions.

- 9:50 **Questions and Needs in Environmental Health and Risk Assessment Communities**—Weihsueh Chiu, *US Environmental Protection Agency*

10:20 *Break*

SESSION 2 TISSUE CHIPS: STATE-OF-DEVELOPMENT

This session will highlight strengths and limitations of new and emerging tissue chip technologies. Speakers will outline the state-of-development of specific tissue chip technologies, available evidence for use of tissue chips as replacements for standard testing models, and aspects of these models that need further development or validation.

Moderator: William Farland[†], *Colorado State University*,

- 10:30 **Microphysiological Modeling of the Reproductive System: Implications for Toxicity Testing and Understanding Disease Pathophysiology**—J. Julie Kim, *Northwestern University*

(continued)

11:00 **Developing a Kidney on a Chip for Clinical and Translational Research**—Jonathan Himmelfarb, *University of Washington*

11:30 **3-Dimensional Liver Platforms for Predicting Drug Toxicity in Humans**—D. Lansing Taylor, *University of Pittsburgh*

12:00 **Q&A with Session 2 Speakers**

12:30 *Lunch on your own*

SESSION 3 SCIENTIFIC CONSIDERATIONS FOR USE OF TISSUE CHIPS IN ENVIRONMENTAL HEALTH RESEARCH

This session will explore scientific challenges and next steps with the application of tissue chip technologies to environmental health research, specifically toxicity testing and risk assessment. Meeting participants will explore the use of tissue chip technologies to address individual variability and susceptibility to toxicants, chronic exposures to environmental stressors, and exposure to multiple environmental stressors, among other challenges in environmental health studies.

Moderator: Lois Lehman-McKeeman, *Bristol-Myers Squibb*

1:15 **Comparative Assessment of 3D Models for Predictive Toxicology**—Franziska Boess, *Roche Pharmaceutical Research and Early Development*

1:45 **Panel Discussion: Application of Tissue Chips to Environmental Health—Scientific Challenges**

- Experiences

Rodger Curren, *Institute for In Vitro Sciences*

Edward LeCluyse, *The Hamner Institutes for Health Sciences*

Christie Sayes, *Texas A&M University*

Russell Thomas, *US Environmental Protection Agency*

3:15 *Break*

3:30 **Panel Discussion: Application of Tissue Chips to Environmental Health—Next Steps for Research**

- Facilitated Discussion with the Audience

Session 3 panelists listed above will be joined by:

Anthony Bahinski, *Wyss Institute*

Kyle Kolaja, *Cellular Dynamics International*

4:45 **Closing Comments**—Lois Lehman-McKeeman, *Bristol-Myers Squibb*

5:00 **Adjourn for the day**

TUESDAY, JULY 22, 8:30AM–NOON*

SESSION 4 USE OF TISSUE CHIP TECHNOLOGIES FOR ENVIRONMENTAL HEALTH DECISIONS: REGULATORY CONSIDERATIONS

Moderator: Joyce Tsuji[†], *Exponent*

8:30 **Panel Discussion: Application of Tissue Chips to Environmental Health—Government Agency Perspectives**

John Bucher—*National Toxicology Program, NIEHS*

Weihshueh Chiu—*Environmental Protection Agency*

Danilo Tagle—*National Center for Advancing Translational Sciences, National Institutes of Health*

TBD—*US Food and Drug Administration*

10:10 *Break*

10:25 **Panel Discussion: Application of Tissue Chips to Environmental Health—Infusing Regulatory Considerations into Research and Development**

11:45 **Closing Remarks**—Ivan Rusyn[†], *University of North Carolina, Chapel Hill*

12:00 **Adjourn Meeting**

* Members of the ESEH committee and government liaison group will meet 12:30pm–3:00pm

For more information and to subscribe for updates, please visit <http://dels.nas.edu/envirohealth>

Emerging Science workshops are free and open to the public.

About the Committee

At the request of the National Institute of Environmental Health Sciences (NIEHS), the National Research Council formed the Standing Committee on Use of Emerging Science for Environmental Health Decisions to facilitate communication among government, industry, environmental groups, and the academic community about scientific advances that may be used in the identification, quantification, and control of environmental impacts on human health.

