

Microphysiological Systems at NCATS: Increasing the Predictivity of Translational Assays

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Microphysiological Systems: Bridging Human and Animal Research
National Academy of Sciences Roundtable on Science and Welfare of Laboratory Animal Use
January 19, 2021

NCATS Mission

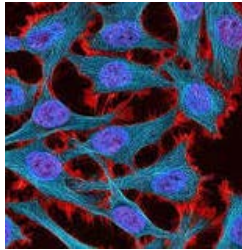


To catalyze the generation of **innovative methods and technologies** that will enhance the development, testing, and implementation of diagnostics and therapeutics across human diseases and conditions.

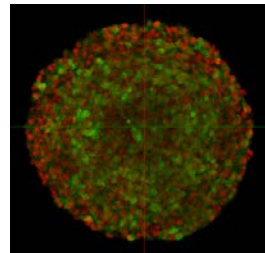


Improved (more predictive?) translational models/assays

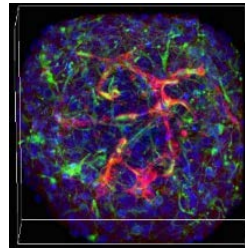
2D



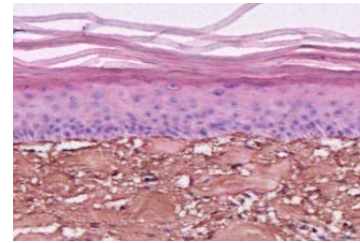
Spheroids



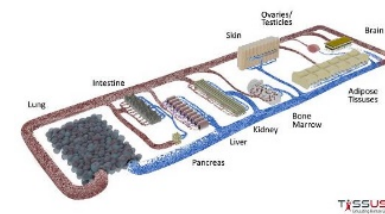
Organoids



Printed Tissues

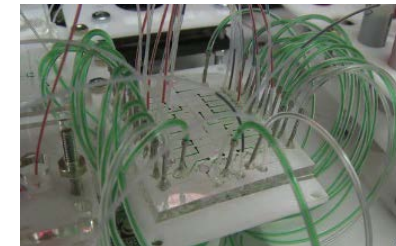
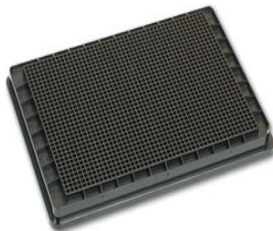


Organ-on-a-chip



HTS compatibility

Physiological complexity



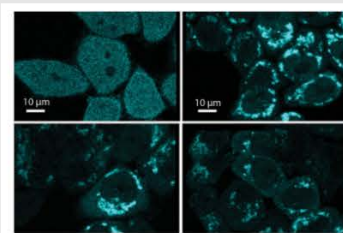


Toxicology in the 21st Century

[OVERVIEW ▾](#)[HIGHLIGHTS](#)[PROJECTS ▾](#)[RESOURCES ▾](#)[CONTACT](#)

Tox21 Scientists Prioritize Compounds to Advance Research on Mitochondrial Damage

As part of the Tox21 collaboration, scientists developed of an analytical approach to enable researchers to prioritize environmental chemicals for their ability to disrupt mitochondria, the power generators of...

[More](#)

ABOUT TOX21

The Toxicology in the 21st Century (Tox21) Consortium is a federal collaboration between the [U.S. Environmental Protection Agency \(EPA\)](#), [National Toxicology Program \(NTP\)](#) headquartered at the National Institute of Environmental Health Sciences (NIEHS), [National Center for Advancing Translational Sciences \(NCATS\)](#), and [Food and Drug Administration \(FDA\)](#).

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PARTNERS

Each of the partners in the Tox21 collaboration brings key expertise

[More](#)

National Toxicology Program



U.S. FOOD & DRUG
ADMINISTRATION



National Center
for Advancing
Translational Sciences

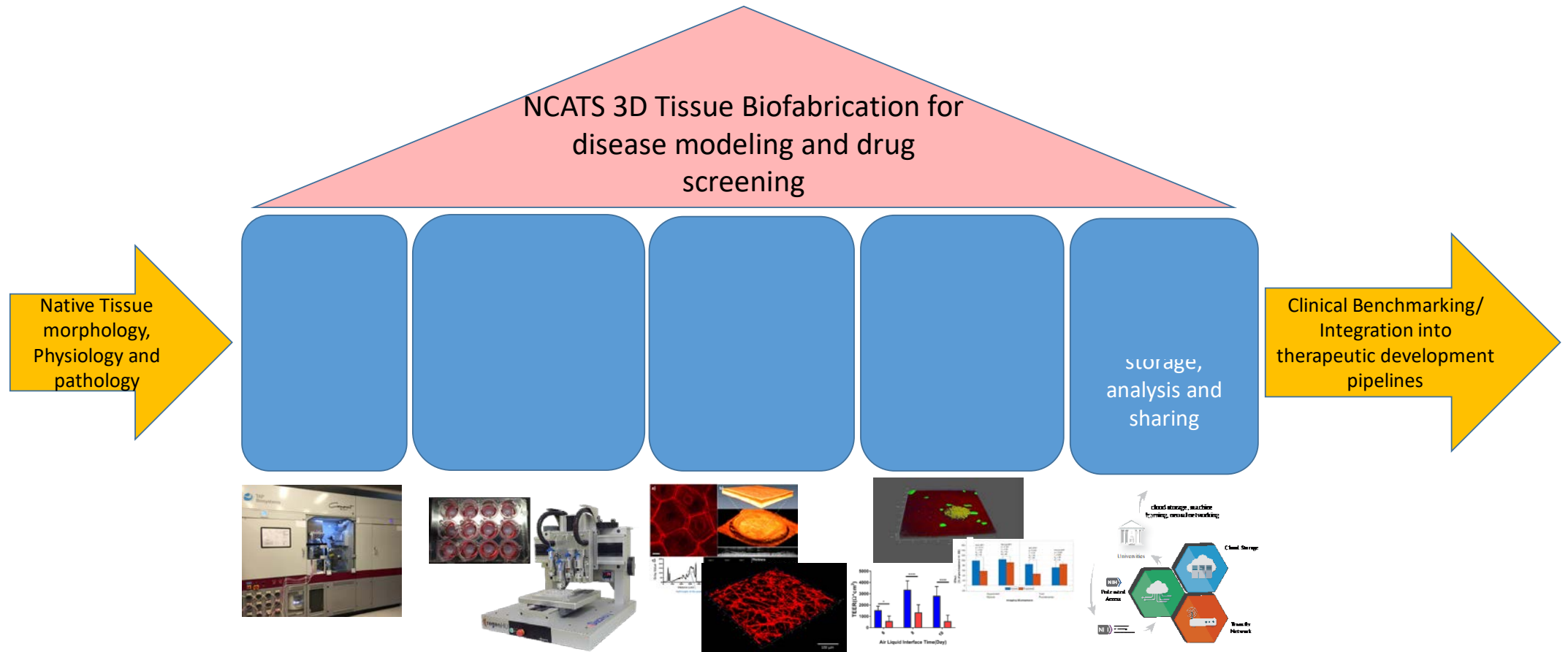


<https://tox21.gov/>



National Center
for Advancing
Translational Sciences

Building a tissue biofabrication capability for disease modeling and drug screening



National Center
for Advancing
Translational Sciences

Tissue Chips for Drug Screening Program

Establishment of NCATS
December 2011

IQ Consortium MPS Affiliate: AbbVie, Alnylam, Amgen, Astellas, AstraZeneca, Biogen, Bristol-Myers Squibb, Celgene, Eisai, Eli Lilly, Genentech, GlaxoSmithKline, Hoffman-La Roche, Janssen Pharmaceuticals, Merck & Co., Merck KGaA, Mitsubishi Tanabe, Novartis, Pfizer, Sanofi, Seattle Genetics, Takeda, Theravance, Vertex

US Food and Drug Administration

* DARPA **\$75 M**

* AstraZeneca, GlaxoSmithKline and Pfizer Reference Set Compounds (2014-2017)

* Center for Advancement of Science in Space (CASIS) or International Space Station – National Laboratory
\$8 M in kind per launch
* NASA **task orders with implementation partners**

2018 – 2022 Disease Models for Efficacy Testing

Nociception, Addiction, and Overdose

RFA-TR-19-003
- 5 awards **(\$25 M HEAL)**

Alzheimer's Disease-Related Dementias

RFA-NS-19-027
- 1 award **\$7.5 M (NCATS \$0.005 M)**

Disease Models

RFA-TR-16-017
NHLBI, NIAMS, NIBIB, NICHD, NIDCR, NIDDK, NIEHS, NINDS, ORWH
- 13 awards **\$75 M (NCATS \$32 M)**
RFA-DK-17-035 Type 2 Diabetes
- 3 awards **\$15 M (NCATS \$0.015 M)**

2010 – 2012
Regulatory Science

NIH – FDA Joint Leadership Council on Advancing Regulatory Science

RFA-RM-10-006
- Heart and Lung Micromachine was one of 4 awards

Common Fund **\$18 M**
FDA **\$2.25 M**

2012 - 2017
Toxicity Studies

NCATS Tissue Chips for Drug Screening

RFA-RM-11-022
- 10 awards

RFA-RM-12-001
- 8 awards

NCATS **\$50 M**

Common Fund, NIBIB, NCI, NICHD, NIEHS, ORWH **\$25 M**

2016 - 2021
Accelerated Aging Models

Tissue Chips in Space

RFA-TR-16-019
- 5 awards **\$12 M**

RFA-TR-18-001 (with NIBIB)
- 4 awards **\$10 M**

2016 – 2020 Building Confidence in MPS

Tissue Chips Testing Centers and Database Center

RFA-TR-16-006, RFA-TR-18-005, RFA-TR-18-006
- 2 TCTCs and 1 MPS DbC **\$24 M**

Self-sustaining beyond NCATS support

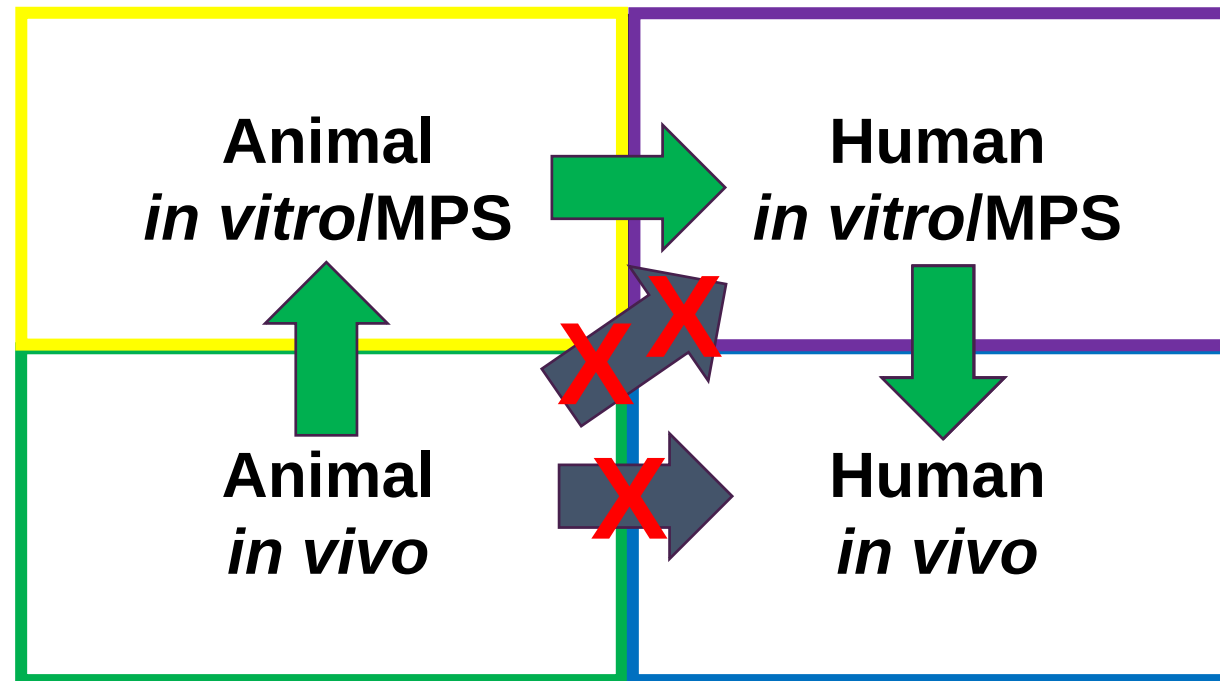
Tissue Chips Consortium



NIH National Center for Advancing Translational Sciences

Why non-human animal MPS?

- Reduce, refine, replace animal use in research
- Evaluate environmental chemical effects on wildlife species
- Advance animal health (veterinary) research
- Bridge animal and human data to allow more robust translational/drug development/regulatory applications of MPS data



NCATS

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