

NCATS Tissue Chip for Drug Screening Program

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The current drug development process is vulnerable to poor prediction of human physiological responses and failure to predict safety and efficacy of candidate drugs using current methods accounts for as much as 90% of the attrition rate. To address this challenge in drug development, the NCATS Tissue Chip for Drug Screening program <https://ncats.nih.gov/tissuechip> is developing alternative approaches for more reliable readouts of toxicity and efficacy. Tissue chips are bioengineered microphysiological systems utilizing chip technology and microfluidics that mimic tissue cytoarchitecture and functional units of human organs. These microfabricated devices are useful for modeling human diseases, and for studies in precision medicine and environment exposures. Tissue chips are poised to deliver a paradigm shift in drug discovery. By emulating human physiology, these chips have the potential to increase the predictive power of preclinical modeling, which in turn will move the pharmaceutical industry closer to its aspiration of clinically relevant and ultimately animal-free drug discovery.

The rapid pace of scientific innovation in the tissue chip field requires a cohesive partnership between innovators and end users. Near term uptake of these human-relevant platforms will fill gaps in current capabilities for assessing important properties of disposition, efficacy and safety liabilities. Similarly, these platforms could support mechanistic studies which aim to resolve challenges later in development (e.g. assessing the human relevance of a liability identified in animal studies). Building confidence that novel capabilities of Tissue chips can address real world challenges while they themselves are being developed will accelerate their application in the discovery and development of innovative medicines. Tissue chips as novel preclinical modeling platforms offer a number of unique opportunities, with improved clinical predictivity the most apparent and the greatest hope for this innovation. But, they may also provide a more efficient approach to mechanistic investigation, early safety liability screening and even more translationally relevant modeling of drug distribution and metabolism. Broad overview of the program, partnerships involved and future directions will be presented at this meeting.