Advanced Organoid Technology for Drug Screening Training Course

Professional Development Training Course Outline

Category	Biotechnology and Pharmaceutical Development	**Duration**	10 Days
Base Fee	$4,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The paradigm of drug discovery is undergoing a profound transformation, driven by the urgent need to address the high failure rate and escalating costs associated with traditional preclinical models. Advanced Organoid Technology stands at the forefront of this revolution, offering 3D in vitro models that more accurately recapitulate human tissue architecture, cellular diversity, and physiological function. These self-assembling, miniature organs, derived from induced Pluripotent Stem Cells (iPSCs) or Patient-Derived Stem Cells (PDSCS), provide an unprecedented platform for personalized medicine and robust disease modeling. Mastering this technology encompassing everything from complex 3D culture methods and High-Content Screening (HCS) to organ-on-a-chip integration is no longer a theoretical advantage, but a critical competency for researchers, pharmacologists, and toxicologists in the modern biopharmaceutical landscape.

Advanced Organoid Technology for Drug Screening Training Course delivers a comprehensive and hands-on deep dive into the cutting-edge applications of organoids, focusing specifically on their utility in High-Throughput Drug Screening (HTS) and toxicity testing. Participants will gain advanced practical skills in generating, characterizing, and leveraging various organoid systems to evaluate therapeutic candidates. The curriculum integrates bioinformatics and AI-driven image analysis for robust data interpretation, preparing scientists to transition these powerful, human-relevant models from the research bench to the preclinical validation pipeline. By bridging the translational gap between in vitro and in vivo results, this course equips organizations to accelerate drug development, significantly reduce animal testing, and improve the predictive validity of their preclinical findings.

Programme Curriculum

Advanced Organoid Technology for Drug Screening Training Course

Introduction

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Course Duration

10 days

Course Objectives

Upon completion of this course, participants will be able to:

1. Establish and Master diverse 3D Cell Culture Protocols for organoid generation from various stem cell sources
2. Design and execute High-Throughput Screening (HTS) campaigns using automated, scaled-up organoid assays.
3. Implement High-Content Imaging (HCI) and AI-driven image analysis for quantitative phenotypic screening.
4. Develop Patient-Derived Organoid (PDO) models for Precision Oncology and predictive Chemosensitivity Testing.
5. Model complex diseases, including Neurodegeneration and Infectious Disease Research, using specialized organoids
6. Assess drug safety and Predictive Toxicology using physiologically relevant Liver and Kidney Organoids.
7. Integrate organoid culture with Microfluidics to create advanced Organ-on-a-Chip (OOC) systems.
8. Apply CRISPR-Cas9 Gene Editing techniques for targeted disease modeling and functional validation within organoids.
9. Characterize organoid fidelity using multi-omic approaches
10. Strategically incorporate the Tumor Microenvironment (TME) components into co-culture models.

11. Troubleshoot common challenges related to organoid reproducibility, scalability, and long-term maturation.
12. Adhere to Quality Control (QC) and standardization metrics for translational studies.
13. Leverage organoid data for Biomarker Discovery and translational research to inform clinical trial design.

Target Audience

1. Research Scientists/Biologists in Pharmaceutical and Biotechnology R&D.
2. Toxicologists and Preclinical Safety Assessors.
3. Laboratory Managers overseeing 3D cell culture and HTS core facilities.
4. Post-Doctoral Fellows and Advanced Graduate Students.
5. Assay Development Specialists and Automation Engineers.
6. Bioinformaticians and Computational Biologists.
7. Pathologists
8. Venture Capitalists and Technology Transfer **Officers**.

Course Modules

Module 1: Foundational Principles of Organoid Biology

- Stem cell sources.
- 3D Cell Culture matrices
- Growth factors and signaling pathways for self-organization and differentiation.
- Differentiation protocols for ectoderm, endoderm, and mesoderm lineages.
- Case Study: Deriving and characterizing intestinal organoids

Module 2: Culturing Patient-Derived Organoids (PDOs)

- Protocols for isolating stem cells from patient biopsies
- Expansion and cryopreservation to establish a PDO biobank.
- Genotypic and phenotypic fidelity assessment.
- Co-culture methods to incorporate Tumor Microenvironment (TME) elements
- Case Study: Establishing a Patient-Derived Tumoroid (PDT) panel for colorectal cancer.

Module 3: Advanced Organoid Systems: The Gut & Liver

- Detailed protocols for culturing functional human Intestinal Organoids.
- IBD, infectious agents, and barrier function assays.
- Generating mature, functional Liver Organoids
- Drug metabolism and ADME/Tox testing applications.
- Case Study: Using liver organoids to predict human drug-induced liver injury (DILI) compared to animal models.

Module 4: Advanced Organoid Systems: Brain & Lung

- Protocols for unguided and guided Cerebral Organoids and their regionalization.
- Modeling Neurodegeneration and neurotoxicity.
- Generating Lung Organoids from iPSCs for airway and alveolar structures.
- Modeling respiratory diseases and Infectious Disease Research
- Case Study: Modeling Zika virus infection and drug efficacy screening in human brain organoids.

Module 5: Organoid-on-a-Chip (OOC) Technology

- Principles of Microfluidics and dynamic culture environments.
- Design considerations for Multi-Organ Systems
- Integrating vasculature and innervation in complex organoids.
- Perfusion culture benefits for long-term maturation and scalability.
- Case Study: Utilizing a gut-liver OOC system to study systemic drug metabolism and toxicity.

Module 6: Assay Development for Drug Screening

- Adapting organoid size and format for High-Throughput Screening (HTS).
- Optimizing end-point assays
- Designing dose-response and combination therapy screens.
- Validation and standardization of organoid-based assays
- Case Study: HTS validation of novel inhibitors against a panel of PDOs.

Module 7: High-Content Imaging (HCI) and Analysis

- Principles of automated confocal and widefield microscopy for 3D structures.
- Sample preparation, clearing, and mounting for deep-tissue imaging.
- Quantitative metrics.
- Image segmentation and feature extraction in 3D
- Case Study: Automated segmentation and analysis of neurite outgrowth in brain organoids.

Module 8: Introduction to AI and Machine Learning in Organoidology

- Fundamentals of Machine Learning (ML) for image-based data.
- Training deep learning models for accurate, unbiased phenotypic classification.
- Predictive modeling of drug response using ML on multi-parametric image data.
- Data management, storage, and cloud-based image analysis pipelines.
- Case Study: Using deep learning to classify healthy vs. diseased phenotypes in kidney organoids.

Module 9: Predictive Toxicology and Safety Screening

- Kupffer cells, immune cells, and endothelial cells.
- Assessing chronic and acute toxicity endpoints.
- High-fidelity cardiotoxicity screening using iPSC-derived Cardioid Organoids.
- Integrating organoid data into Adverse Outcome Pathways (AOPs).
- Case Study: Screening a chemical library for potential teratogens using developing organoids.

Module 10: Gene Editing for Disease Modeling and Reporter Lines

- CRISPR-Cas9 fundamentals and guide RNA design in stem cells.
- Generating reporter organoids.
- Creating isogenic disease models for drug testing.
- Optimizing transfection and selection protocols for organoids.
- Case Study: CRISPR-Cas9 correction of a ?öF508 CFTR mutation in cystic fibrosis rectal organoids.

Module 11: Multi-Omics Characterization

- Protocols for dissociating organoids for Single-Cell RNA Sequencing.
- Integrating scRNA-seq with bulk genomics and proteomics data.
- Data analysis pipelines for identifying novel cell types and disease pathways.
- Correlating omics signatures with functional drug response data.

- Case Study: Using scRNA-seq to confirm cell type diversity and maturation of lung organoids.

Module 12: Bioprinting and Advanced Bioengineering

- Principles of 3D Bioprinting and bio-ink selection for scaffold-based organoids.
- Precise spatial control of cell and matrix deposition.
- Vascularization strategies for large, complex organoids.
- Automation and scale-up using automated liquid handling and robotic systems.
- Case Study: Bio printing vascularized tissue for long-term drug perfusion studies.

Module 13: Reproducibility, Standardization, and Automation

- Addressing variability in organoid size, maturation, and differentiation.
- Implementing strict Quality Assurance (QA) and Good Laboratory Practices
- Automation strategies for media exchange, passaging, and screening
- Data management, electronic lab notebooks (ELNs), and LIMS integration.
- Case Study: Review of the Hubrecht Organoid Technology (HUB) certification standards for PDOs.

Module 14: Translational and Regulatory Landscape

- Using organoid data for IND-enabling studies and regulatory submission.
- FDA and EMA perspectives on New Approach Methodologies (NAMs).
- Correlation of PDO Drug Response with clinical outcomes for personalized medicine.
- Developing organoids as Companion Diagnostics (CDx).
- Case Study: Clinical trial examples where PDO drug response successfully predicted patient chemotherapy efficacy.

Module 15: Future Trends and Commercialization

- Assembloids and complex organ systems.
- Organoids for Cell Therapy and regenerative medicine.
- Commercialization pathways for organoid technologies and service providers.
- Ethical considerations in using human stem cell-derived models.
- Case Study: Discussion on the commercial success of a major organoid-based CRO/service provider.

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call +254769199797

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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