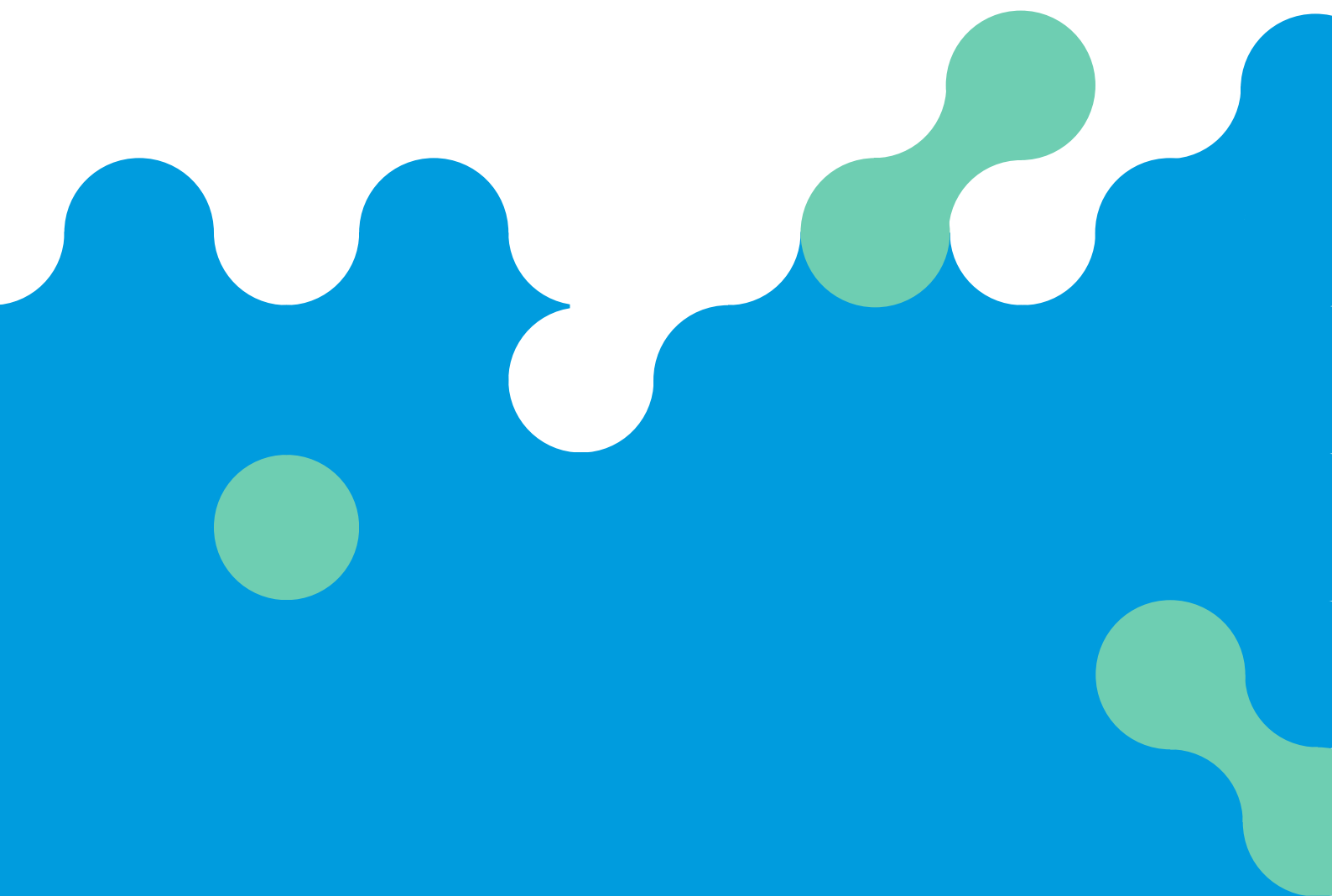


Beyond 2D

Integrating Cardiac Organoids into High-Throughput Contractility Analysis



Challenge

Increasing model complexity can improve predictive accuracy and biological relevance, but comes with higher costs, lower throughput, and greater technical demands.

Three-dimensional cardiac models offer the opportunity to better capture the structural and functional complexity of human cardiac tissue. Yet, their adoption in scalable functional assays remains limited by differences in model format, handling, attachment, and measurement needs.

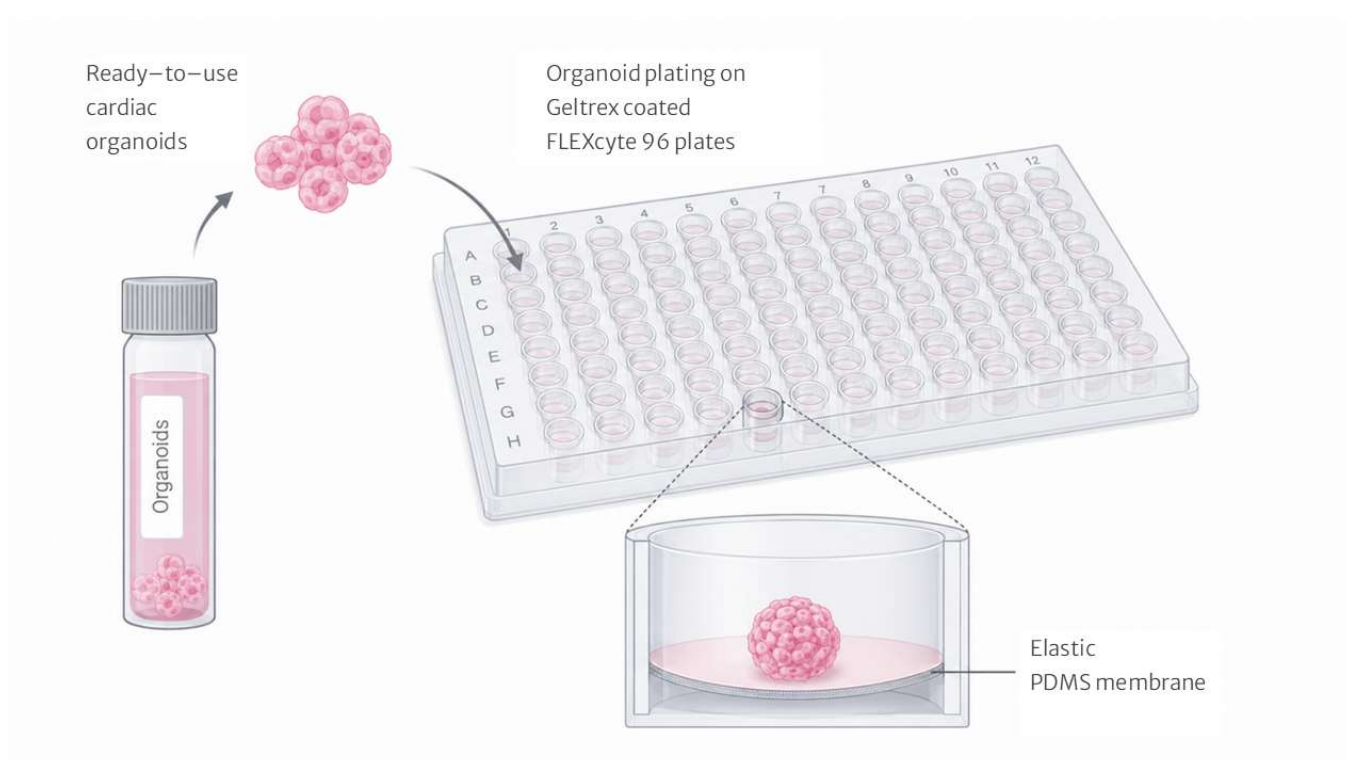
It is therefore essential to establish workflows that enable functional assessment of 3D cardiac models while maintaining throughput and reproducibility.

The FLEXcyte 96 platform addresses this challenge by enabling functional contractility measurements directly in a standard 96-well plate format.

Approach I

Integration of ready-to-use cardiac organoids

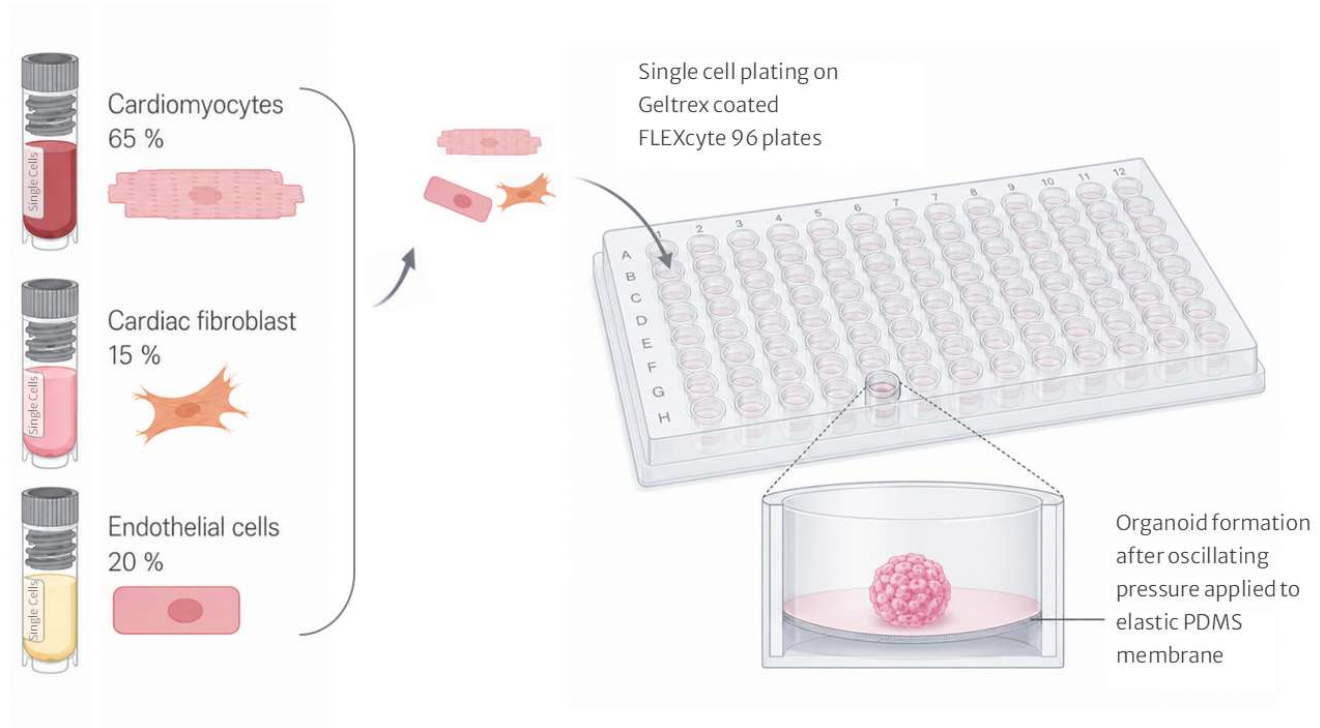
Ready-to-use cardiac organoids are transferred directly onto FLEXcyte 96 plates for subsequent culture and functional assessment.



Approach II

Direct generation of 3D cardiac models on FLEXcyte 96 plates

Cardiac single cells are directly introduced onto the FLEXcyte 96 plates, enabling the formation and maturation of 3D cardiac structures within the assay format via oscillating pressure applied to the PDMS membrane.



Workflow

Day 0 | Organoid seeding

Approach I: Cardiac organoids are thawed and seeded onto Geltrex-coated FLEXcyte 96-well plates. The number of organoids per well is adjusted according to organoid size, with 1 organoid used for diameters $>600\ \mu\text{m}$ and up to 10 organoids for diameters $<100\ \mu\text{m}$.

Approach II: Cardiomyocytes, cardiac fibroblasts, and endothelial cells are seeded directly onto Geltrex-coated FLEXcyte 96 plates. During cell settlement, oscillating pressure centers the cells on the membrane, resulting in the reproducible formation of cardiac organoids.

Day 2–10 | Culture & attachment

Complete medium changes are performed every other day. During this period, the organoids establish stable attachment to the FLEXcyte substrate and adapt to the assay environment.

Day 11–14 | Functional assay window

Following the attachment and stabilization phase, organoids enter the assay window for compound treatment and contractility analysis.

Outcome

The established workflows enable both ready-to-use organoids and directly generated 3D cardiac models to be functionally assessed within the FLEXcyte 96-well format.

Both workflows provide a flexible route to incorporate different 3D cardiac models into scalable contractility studies, combining increased model complexity with a label-free, functional readout.

Applications

- Drug efficacy and pharmacology
- Cardiotoxicity assessment
- Disease modelling
- Compound profiling
- Mechanistic studies of cardiac function

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