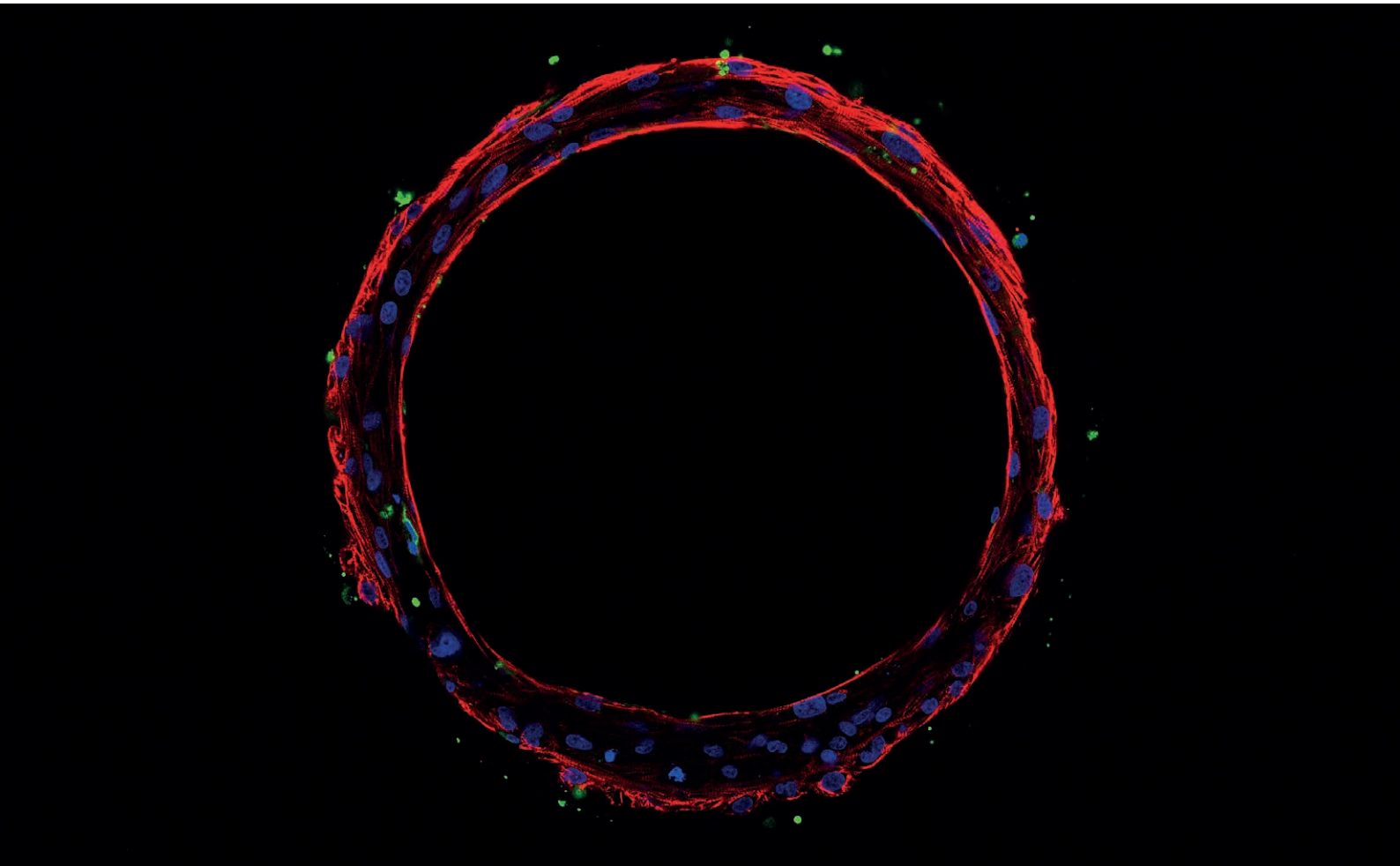
4Dcell
explore better.

4Dcell SmartHeart plates
Innovative cardiac organoids

Circular 3D morphology mimicking heart physiology
Multiple key read-outs in a single assay
Reproducible size and shape
Easy to image
High throughput

High resolution imaging



4Dcell SmartHeart Plates

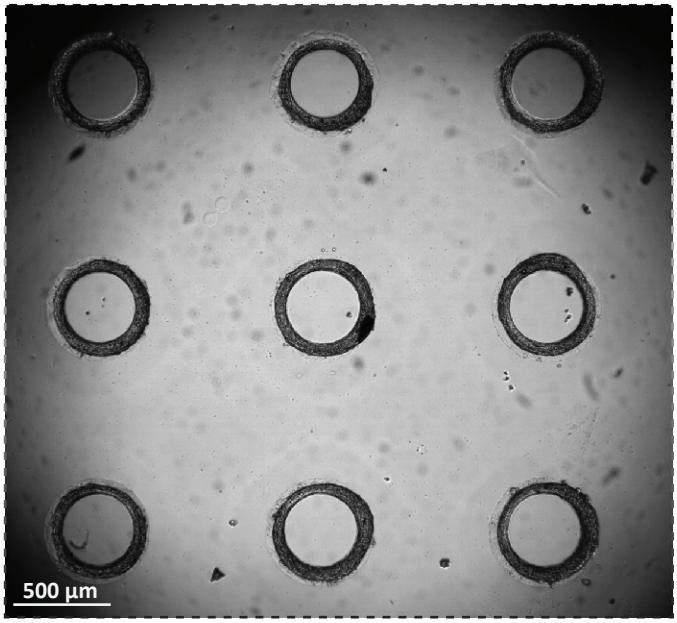
Circular 3D morphology moves towards a better model for heart physiology

The SmartHeart is a 3D cardiac assay, which enables both the self-assembly and maturation of functional cardiac organoids based on cardiomyocytes derived from hiPSC as well as the acquisition of the most relevant read-outs, all in a single platform

The hydrogel is optically transparent enabling high resolution imaging of the tissues as well as to observe ionic transients.

The hydrogel shape provides a microenvironment which enables the cells to sediment and aggregate into **a beating ring within hours**.

SmartHeart allows the acquisition of many relevant read-outs, all of this in a single platform. It can be used to test new compounds or assess toxicity of drugs targeting other types of pathologies, as it can be simply scaled to fit HTS and HCS requirements.



Main read-outs

Beating frequency
Beating amplitude
Contractility force
Ionic Exchange
Tissue morphology
Intra cellular imaging

Flash the QR code
to watch the SmarHeart beating

4Dcell offers

6, 12, 24 and 96 glass-bottom multiwell plates* with microstructured hydrogels.

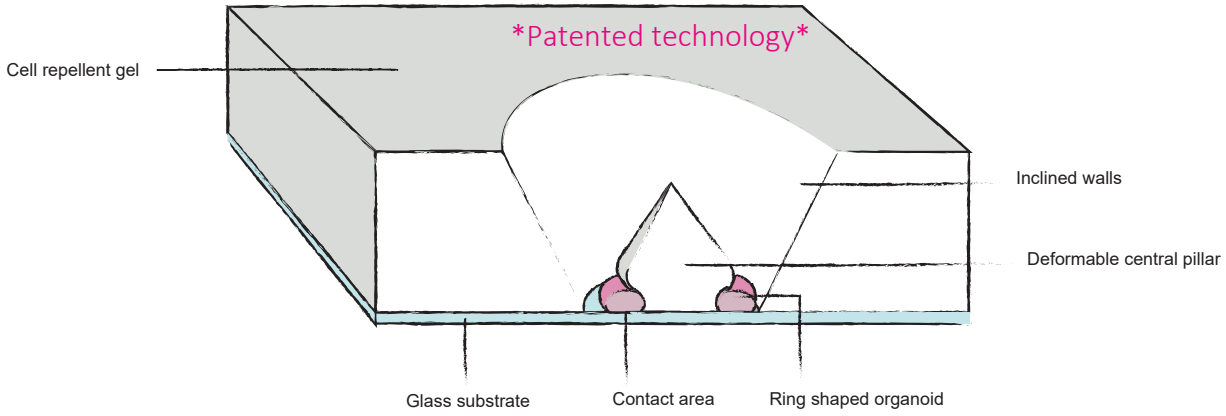
* Contact us in case these formats do not fit your needs

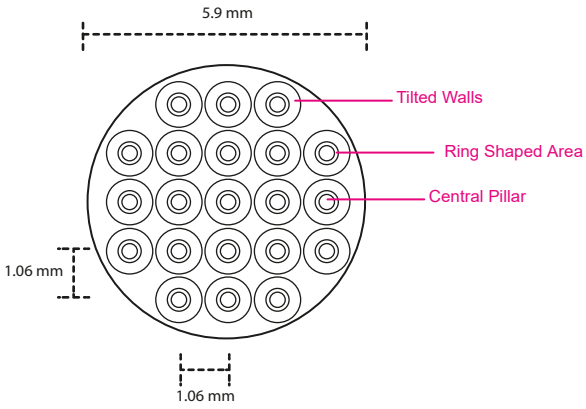
SmartHeart: an innovative micro-engineered hydrogel to mimick the heart morphology

Cell culture substrates, as multiwell plates, are coated with a 3D structured hydrogel, molded into an array of conical-shaped microwells containing a central pillar.

When cells are seeded on top of these microstructures, they are guided towards the ring-shaped cavity, self-assembling into a circular tissue, which surrounds a hydrogel central pillar.
The contractility force, beating rate and beating amplitude are assessed through the deformation of the central pillar, as the mechanical properties of the hydrogel are known and can be adjusted to match the cell model.

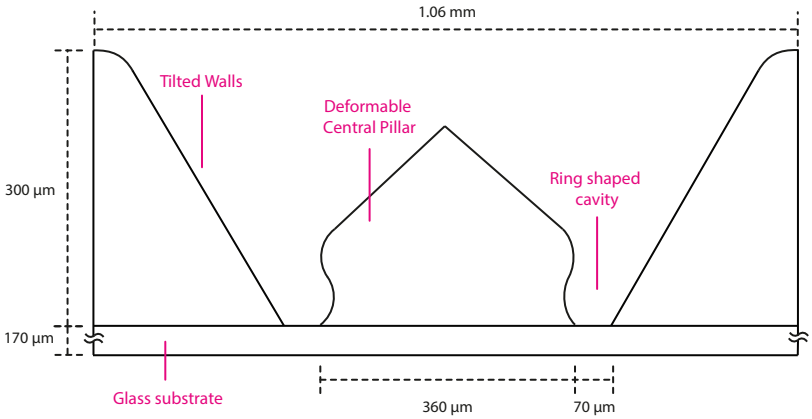
The contact area and the engineered shape of the central pillar help preventing the loss of the cardiac tissues.

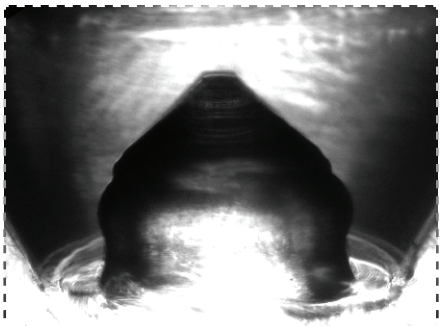




21 rings per well

The ring shaped cavities for cell culture are molded on biocompatible hydrogels (polyethylene glycol- PEG), using molds fabricated by high-resolution milling.

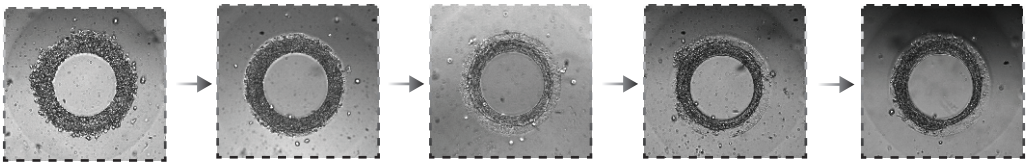


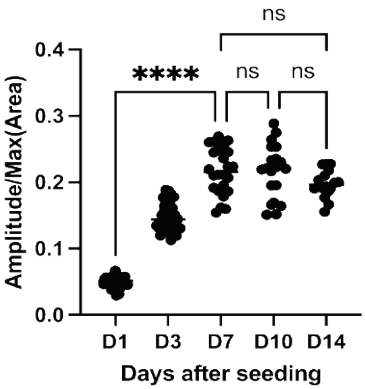


3D ring shapped cavities reproduced in PDMS

Assembly and maturation of tissues

Maturation of the tissues during 14 days. Cells form connections between them and become elongated mimicking the heart tissue. Maximum contraction of the tissues recorded during 14 days, to assess their maturation.

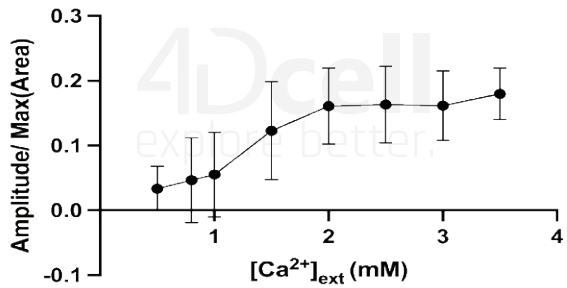




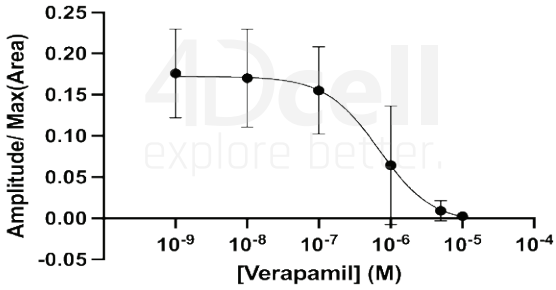
Drug tests

The tissues were subjected to different standard drugs to assess their pharmacological response.

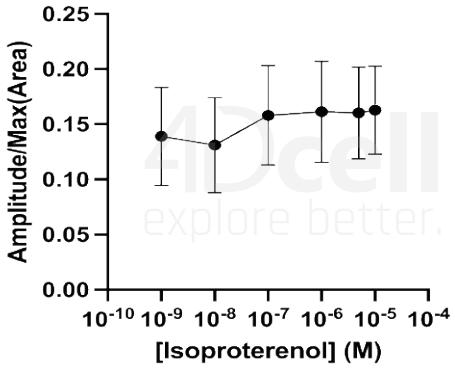
Calcium - induces a larger contraction amplitude of the tissues



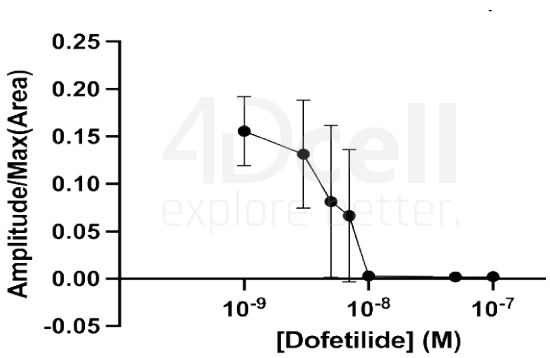
Verapamil - calcium channel blocker



Isoproterenol - adrenergic receptor agonist which results in increased beating frequency and contraction

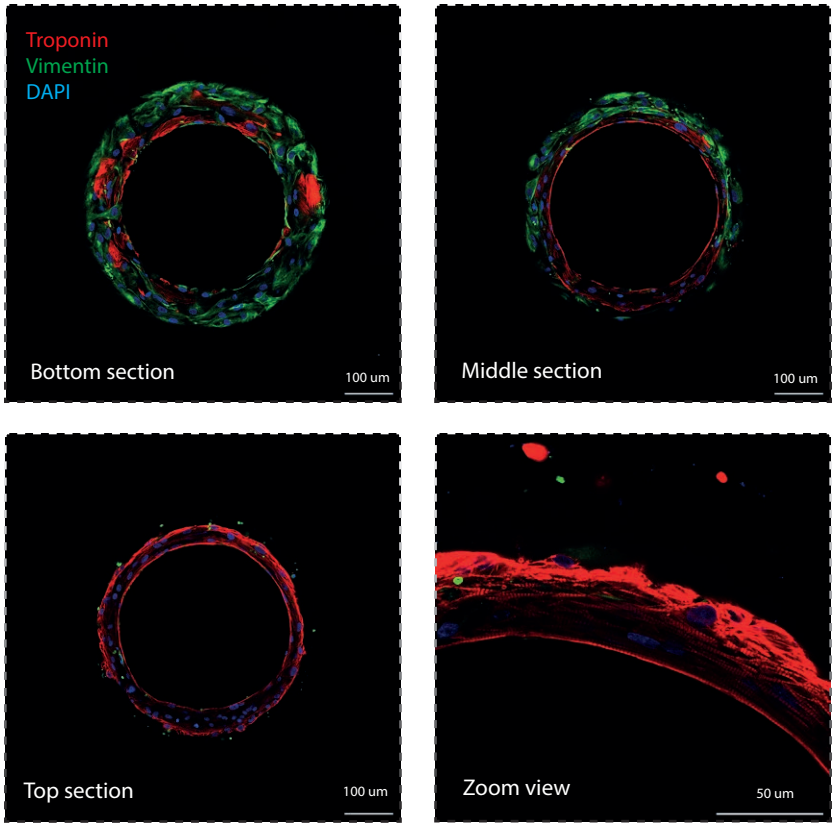


Dofetilide - antiarrhythmic agent, can have toxic effects when overdosed



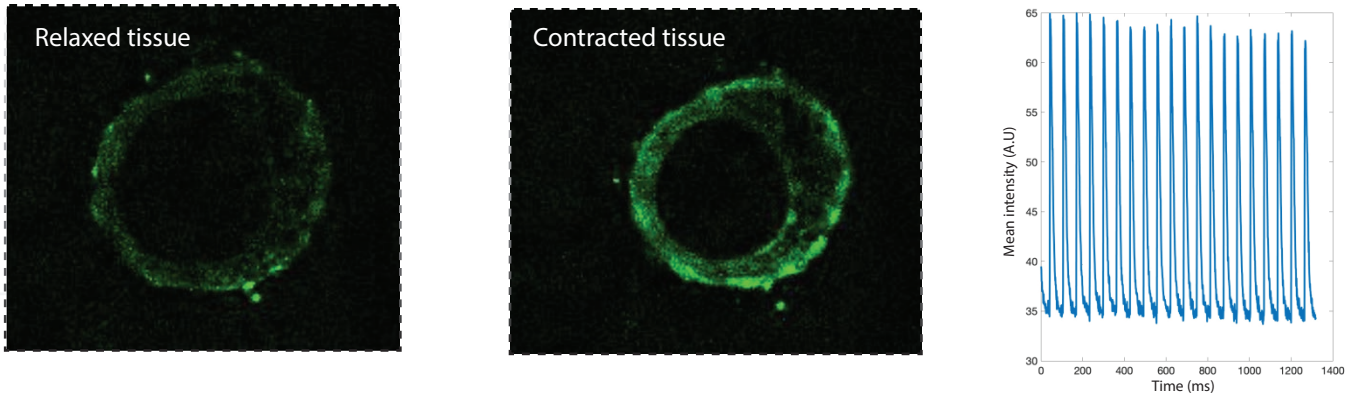
High-resolution imaging: tissue morphology and intracellular imaging

Immunofluorescence imaging of the tissues after 14 days. Z-scan using confocal microscopy.
Fibroblasts are added to provide stability to the tissues, by forming a structural layer below the iPSC-CMs.



Calcium imaging

Preliminary data of tissues stained with a calcium fluorescent dye.



Stability and storage

The plates can be stored at room temperature for up to 3 months from the date of delivery.

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