Agilent
Trusted Answers

Agilent xCELLigence RTCA ePacer

Enabling functional maturation of hiPSC cardiomyocytes using directed electrical pacing

How Mature are Your Human Induced Pluripotent Stem Cell Cardiomyocytes

Human induced pluripotent stem cell (hiPSC) cardiomyocytes are actively used in the academic and biopharma industries for toxicity assessment, drug discovery, and investigation as cardiac models. The biggest barrier to full adoption of these cells is their inherent immature characteristics.

Several natural engineering approaches attempting to enhance the structural and functional maturity of hiPSC cardiomyocytes have been described in literature. These descriptions include coculture, mechanical conditioning, use of ECM substrates with different degrees of stiffness, and electrical pacing.

Efficient propagation of electrical signals is a crucial aspect of the cardiomyocyte developmental program and functionality. The xCELLigence real-time cell analysis (RTCA) ePacer is designed to use a natural development program of in vivo stimuli for cardiomyocyte “maturation” in a consistent, tunable, scalable, and high-throughput manner. The development program is compatible with different types of relevant readouts.

Agilent xCELLigence RTCA ePacer

Agilent’s innovative solution for maturing human iPSC cardiomyocytes, provides an improved predictive model for drug discovery, pharmacology, and cardiac disease research.

Tunable

Set up precise control of the beating rate over different time durations, to improve the functionality of hiPSC cardiomyocytes and their response to inotropic compounds.

Scalable

Simultaneously pace your cells from just a few wells up to six E-Plates for more high-throughput experiments.

Flexible

Compatible with different types of workflow, such as calcium measurements, high-content microscopy, voltage-sensitive dyes, and plate readers.

Consistent

Highly controlled pacing conditions result in consistent data across different plates and different experiments.

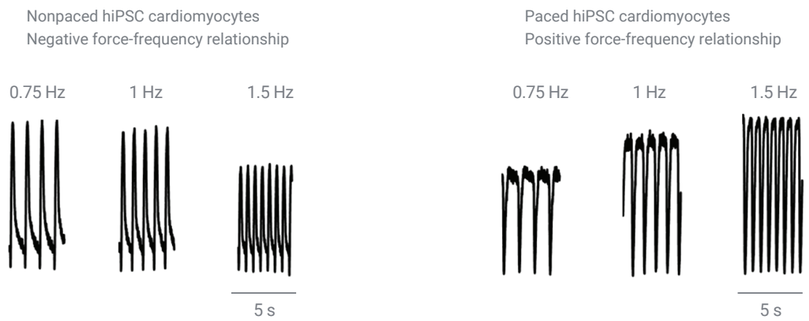


Figure 1. hiPSC cardiomyocytes display a negative force-frequency relationship (left panel), which is reversed by long-term electrical pacing using the ePacer (right panel).

Agilent xCELLigence RTCA ePacer

The Agilent xCELLigence RTCA ePacer provides an easy and effective way to produce functionally mature hiPSC cardiomyocytes. Under precise and consistent electrical pacing conditions, the ePacer improves the maturation status of the hiPSC cardiomyocytes in just 2-3 weeks, without any detectable toxicity or stress to the cells.

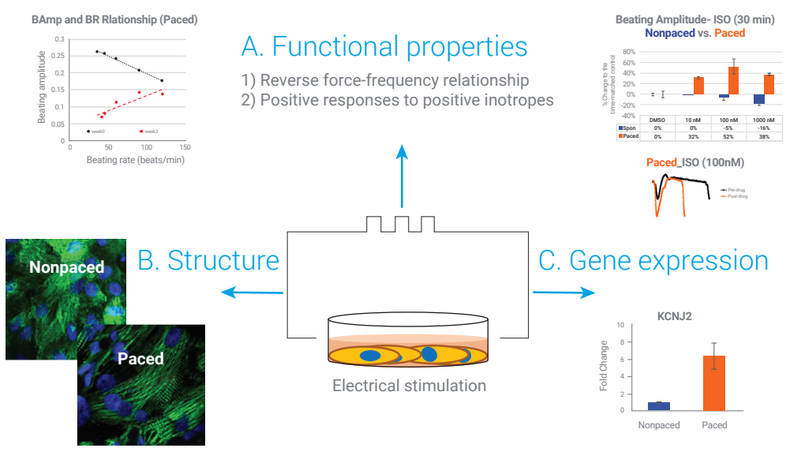
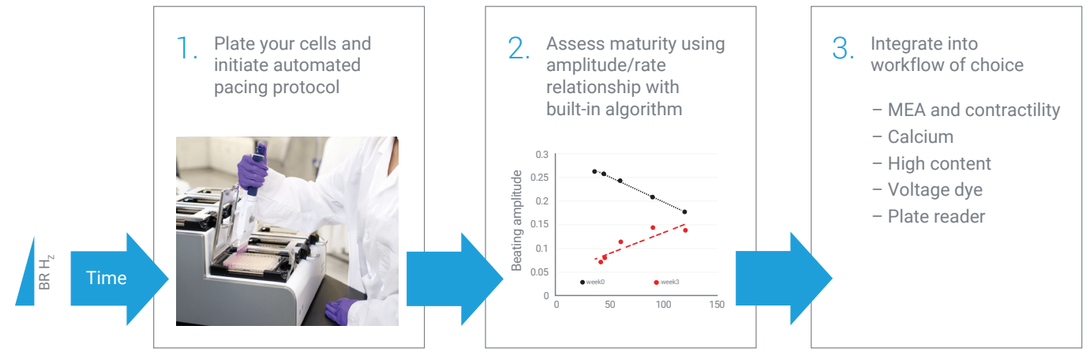


Figure 2. After being subjected to directed progressive electrical pacing using the xCELLigence RTCA ePacer, the hiPSC cardiomyocytes were able to demonstrate A. positive force-frequency relationship and appropriate contractile responses to inotropes; B. significantly improved organized sarcomere structure; and C. proper gene expression.

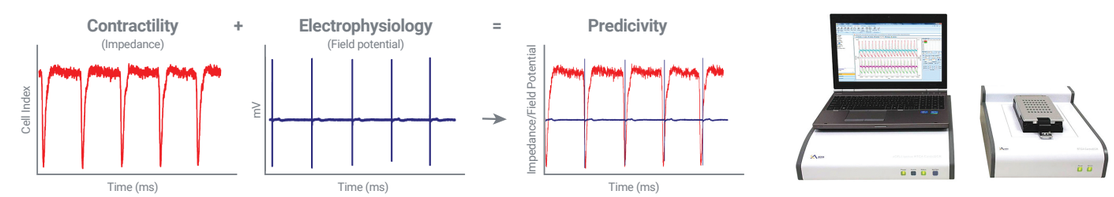
Integrate into your existing workflow

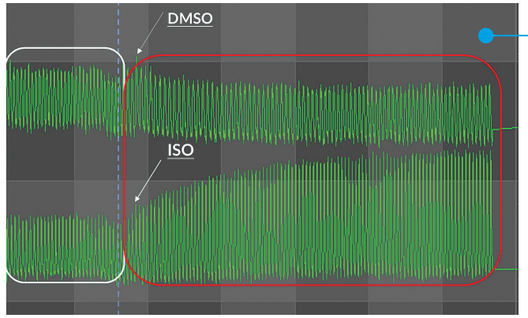
The Agilent xCELLigence RTCA ePacer is adaptable and can easily integrate into your existing assay workflow. The view area on the E-Plate Cardio VIEW 96 allows for integration of paced cells with other optical assays.



MEA and contractility

After being subjected to long-term electrical pacing on the xCELLigence RTCA ePacer, contractile and electrical responses of the hiPSC cardiomyocytes can be assessed using the xCELLigence RTCA CardioECR system.



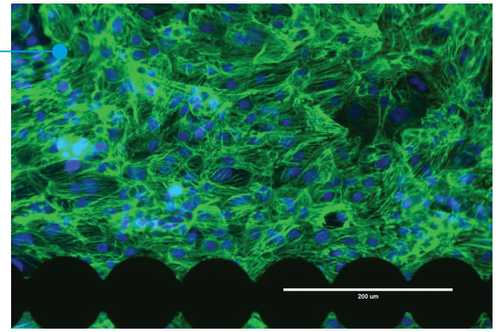


Calcium transient measurements

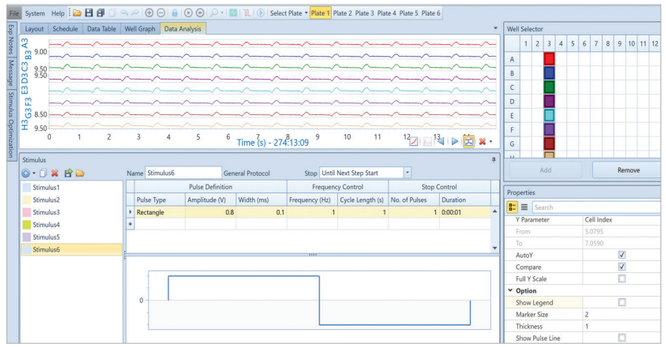
After long-term electrical pacing using the xCELLigence RTCA ePacer, iCell Cardiomyocytes2 were pre-incubated with Ca2+ dye and buffer for 1 hour. The Ca2+ signals were then measured using the Hamamatsu FDSS/µCELL before and after DMSO and ISO addition.

High-content imaging

After being subjected to a long-term electrical pacing using the xCELLigence RTCA ePacer, iCell Cardiomyocytes2 were immunostained for cardiac troponin C (green) and nuclei (blue) right on the E-Plate Cardio VIEW 96. The image (20x) was obtained using ImageXpress Micro confocal.

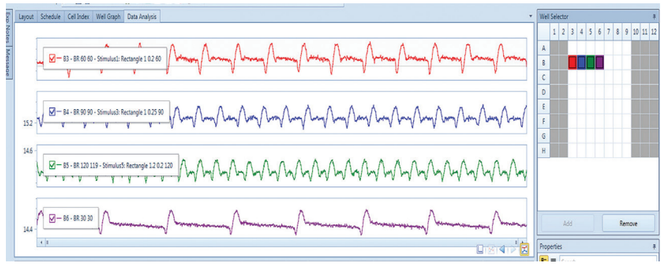


Software



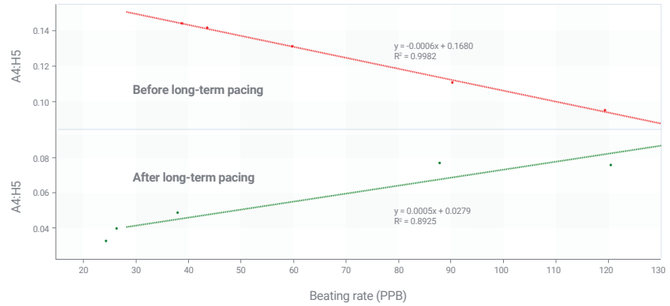
Tunable pacing function

Stimulus settings, such as pulse type, pulse intensity, pulse length, and stimulation duration can be easily selected and defined by the user.



Independent pacing settings for individual columns and plates

Stimulus settings can be applied based on individual columns or across different plates.



Quick and easy method to evaluate cell maturation status using force-frequency relationship calculation

The built-in algorithm automatically generates force-frequency relationship curves before and after long-term pacing process.

Ordering Info

Product	Part Number
ePacer instrument bundle for 6 Cardio cradles station	380601630
ePacer instrument bundle for 6 CardioECR cradles station	380601640
ePacer instrument bundle for 3 Cardio cradles and 3 CardioECR cradles station	380601650
ePacer instrument bundle for customer configuration station	380601660
xCELLigence RTCA ePacer analyzer	380601520
ePacer station with 6 Cardio cradles	380601530
ePacer station with 6 CardioECR cradles	380601540
ePacer station with 3 Cardio cradles and 3 CardioECR cradles	380601550
ePacer station-customer configuration	380601560
E-Plate Cardio 96 (6 plates)	300601050
E-Plate Cardio 96 (36 plates)	300601060
E-Plate Cardio VIEW 96 (6 plates)	300601080
E-Plate Cardio VIEW 96 (36 plates)	300601090
E-Plate CardioECR 48 (6 Plates)	300601110
E-Plate CardioECR 48 (36 Plates)	300601120

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