

Cuore

High-throughput functional measurements
of 3D engineered muscle tissue.



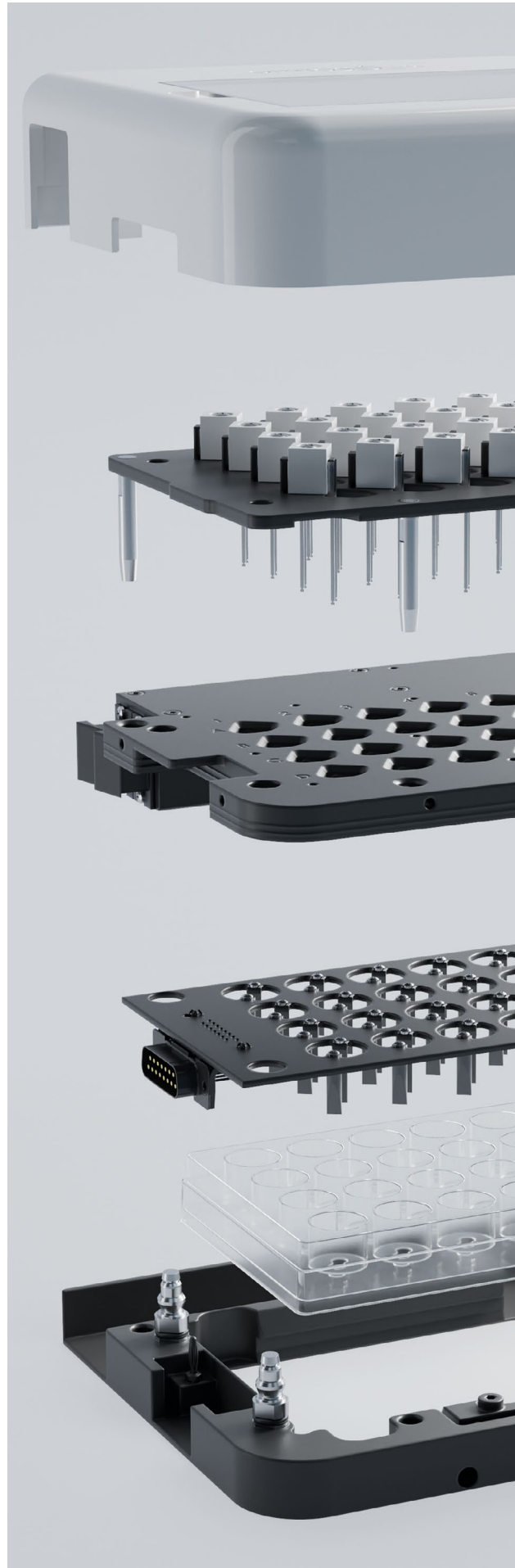
UNLOCK THE POWER OF **MECHANOBIOLOGY**

Cuore offers

Cuore is an all-in-one platform for measuring muscle force with customizable electrical stimulation, providing valuable biological insights based on contraction dynamics.

- **Use iPSC, immortalized, or primary cells:** Only 600k cells are required per engineered muscle tissue, maximizing cost efficiency.
- **Increase physiological insights:** Contraction dynamics of 3D muscle tissue can be monitored in the incubator to better understand disease and/or therapy effects.
- **Measure Accurately:** Optics11 Life's optical fiber technology enables high-precision force readings, capturing the most subtle changes in contractility dynamics.
- **Scalable platform:** Experiments can be designed and automated in a 24-well plate format encased in a single Smart Lid unit. The system supports expansion to 4 × 24-well plates with integrated electrical stimulation and monitoring. Components are reusable and autoclavable.





Applications

Cuore enables non-destructive monitoring of muscle contraction dynamics and is validated for both skeletal and cardiac muscle applications.

Key applications include:

- **Disease Modeling:** Reproduce (patho)physiology using genetically modified cell lines and isogenic controls to assess mutation-specific changes in muscle contractility.
- **Drug Development:** Assess effects on muscle function for drug efficacy and safety in physiologically relevant muscle models.
- **Linking drug efficacy to muscle function:** Gain insights into the functional impact of next-generation therapies, including gene and RNA-based treatments, by assessing how they influence muscle performance.

Cuore streamlines therapy development and accelerates translational research, supporting custom experimental designs for a broad range of therapeutic modalities.

Cuore's 3D model

In developing therapies for cardiovascular and skeletal muscle diseases, the use of reliable, translatable models is essential. 3D cardiac and skeletal muscle tissue models **replicate the structure, architecture, and cellular interactions of human tissue**, and have been shown to **represent human physiology better than traditional 2D or animal models**¹.

Cuore's pillar-based 3D in vitro model combines physiological complexity with ease of execution, **enabling translatable results** while maintaining **throughput and cost efficiency**.

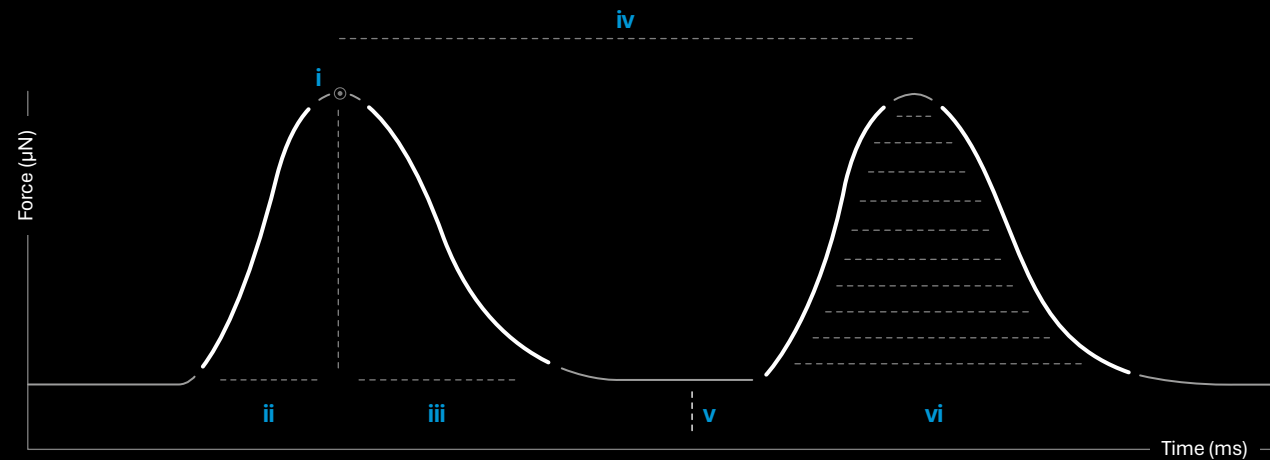
By enabling detailed insights into muscle contractility, these models support a deeper understanding of disease mechanisms, enhance drug testing accuracy, facilitate biomarker discovery, reduce reliance on animal models, and advance personalized medicine.



¹ | Iuliano et al., 2023, DOI: 10.1002/admt.202300845

Cuore's capabilities

Manual analysis is in the past – Cuore Viewer automatically quantifies every contraction dynamic. Below is a selection of key parameters, more metrics can be extracted.



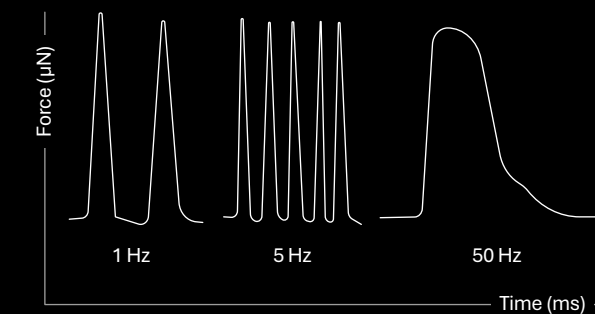
- i** Maximum force
- ii** Contraction Time
- iii** Relaxation time
- iv** Frequency / Period
- v** Tension build up
- vi** Peak widths at all peak heights

Streamlined Analysis

We have taken it one step further, enabling seamless export and visualization of key insights.

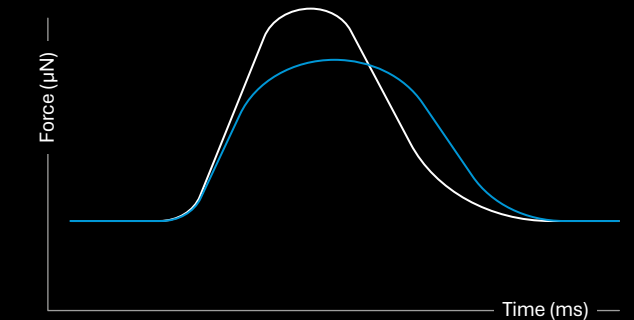
- Export analyzed data in Excel format.
- Filter by custom labels, wells, and stimulation settings.
- Obtain detailed analysis on all parameters for individual contractions, as well as the mean, median, and standard deviations for each segment.

Tailored Stimulation



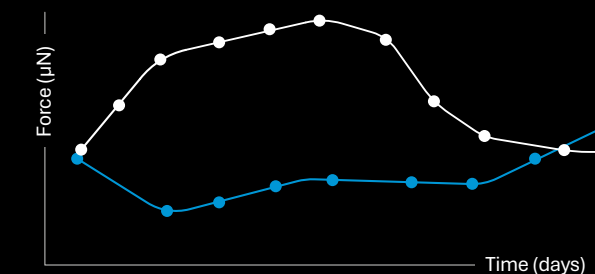
Cuore integrates electrical stimulation across every well. Customize protocols for separate well groups to assess muscle function with precision and evaluate the impact of exercise in a reproducible manner.

Real-Time Insights



Monitor all features live and non-destructively, enabling direct comparisons between disease models, acute drug responses, and muscle fatigue under electrical stimulation.

Long-Term Effects



Cuore automates stimulation and data collection to track muscle dynamics over extended periods, providing insights into disease progression, phenotype restoration, exercise effects, and drug efficacy.

Unparalleled performance through innovative laser technology

600.000

Cell number per engineered muscle bundle.

0-100 Hz

Stimulation frequency range for individual wells.

24 x 4

Electrically stimulate 96 tissues, all in parallel or in groups of 4.

Incubator Ready

Measure continuously under stable conditions.

Microscope Compatible

Brightfield and fluorescence inverted microscopes.

1 – 4.200 μ N

Absolute force range that can be measured.

1-15 kHz

Acquisition speed range for 4 samples in parallel.

0 – 50 mA

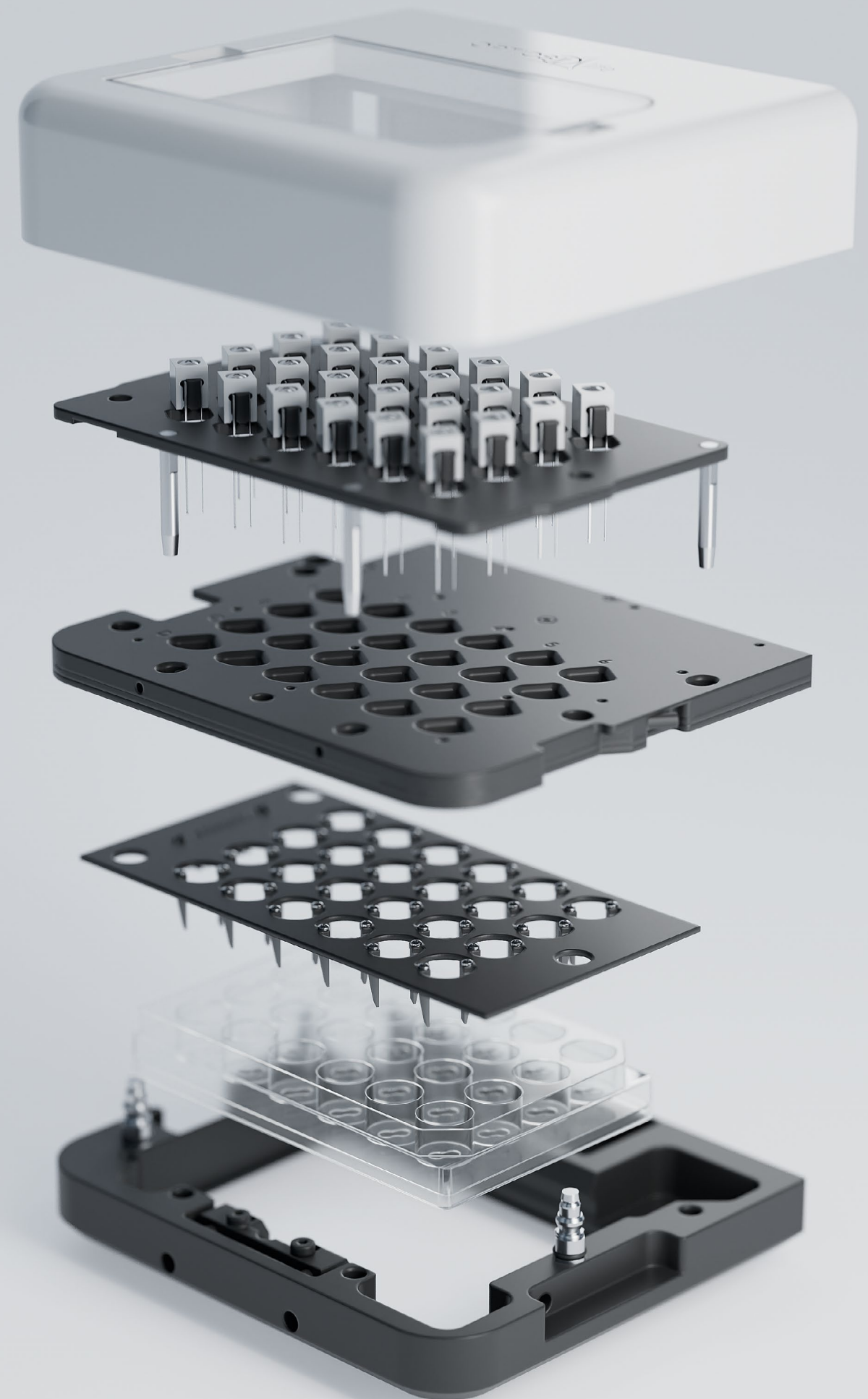
Stimulation amplitude per sample; adjustable between ± 12 volts.

17.5 x 15.3 x 5.2 cm

Compact footprint in the incubator to scale throughput without interfering with ongoing research.

Reusable

Components are reusable and autoclavable.



Platform layout

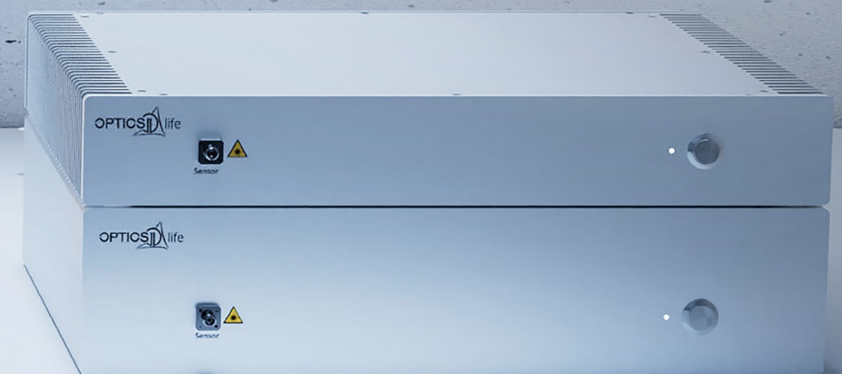
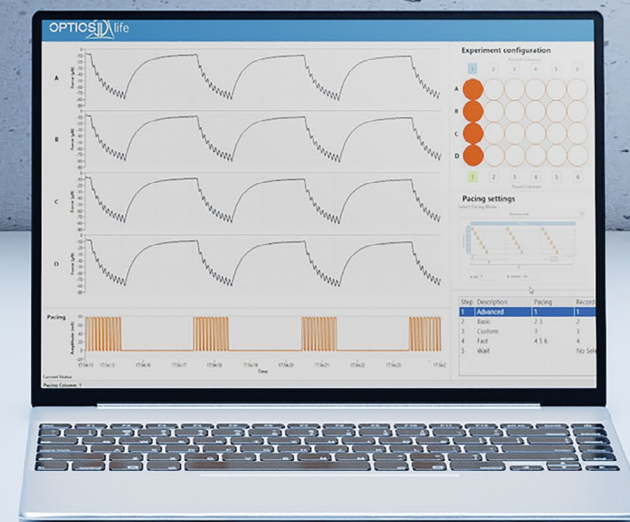
The platform includes a force recording box, a stimulation controller box, and a computer to control **up to 4 smart lids in parallel**. The 24-well plate units called Smart Lid integrate force sensing and electrical stimulation in a compact format.

The controller software is user-friendly, allowing researchers to design experiments with live **contraction force monitoring** and customizable **electrical stimulation**.

The analysis **software is free of charge** and can be installed on an unlimited number of devices.

The smart lids are **reusable** and **autoclave-compatible**. The included consumables can withstand a minimum of five autoclave cycles.

Biological and technological expertise is provided during installation and trainings. The Cuore system comes with validated protocols for both cardiac and skeletal muscle to help researchers get started.



What our users say



KING'S COLLEGE LONDON |

Giancarlo Forte

My group focuses on pathological mechano-sensing and exploits advanced disease models to study it. I strongly believe Cuore might become a catalyst for new discoveries in the field. We currently use the setup to generate models of the diseased heart from hiPSCs and so far enjoyed its user friendly interface and its ability to monitor live muscle physiological parameters.



LUMC | Marnix Franken

In our group, we work on 3D muscle-on-a-chip models for FSHD. Now, with the help of the Cuore from Optics11 Life, we are enhancing the development of our 3D muscles using automated training protocols. We are excited to see what the future will bring with the Cuore!



ERASMUS MC | Pim Pijnappel

The optical fiber-based technology that Optics11 Life is applying for contractile force sensing of skeletal muscle-on-a-chip opens an entire next level at which basic, applied and clinical research will be performed.



LUMC | Christine Mummery

Through my work on cardiac disease modelling with pluripotent stem cells (hiPSC's), I see an emergent need for massive parallel end-to-end force testing technology on engineered heart tissue. This will enable more accurate phenotyping and more effective drug targeting during early drug development. Optics11 Life's fiber sensing technology is uniquely qualified to offer a powerful solution.



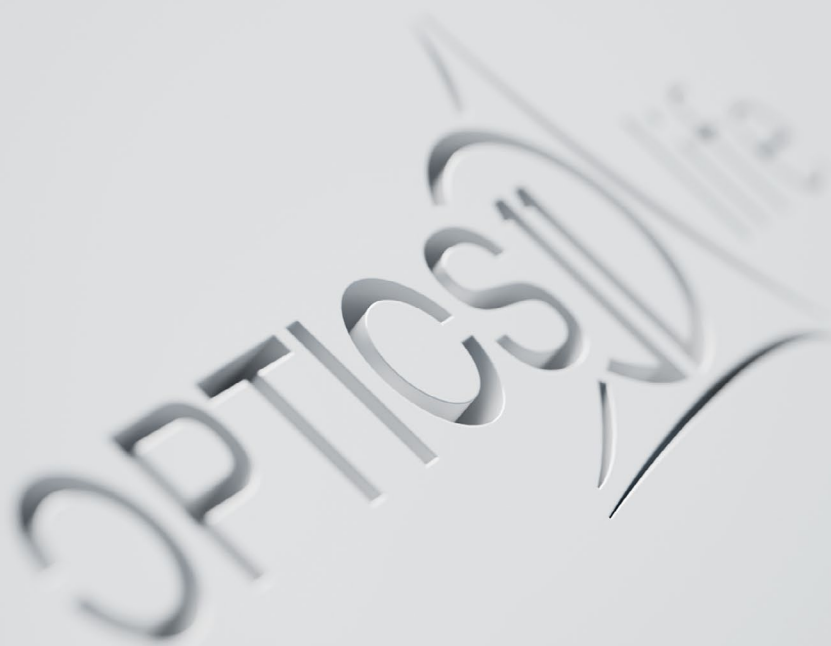
AMSTERDAM UMC | Jolanda van der Velden

Cuore is a wonderful, easy to use system to make stem cell-derived engineered heart preparations and continuously monitor contractility. I anticipate that we will be able to use Cuore for future high throughput studies testing effectiveness of compounds and metabolic stressors. As such the system will be key to better understand cellular pathomechanisms involved in heart disease.





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