

# Myocardial In Vitro Platform for Drug Development and Cardiotoxicity Screening (2021-003)

Engineered Heart Tissue Culture and Screening Platform with Integrated Mechanical and Electrical Stimulation Enabling Physiologically Relevant Metrics for Improved Drug Development Outcomes and Reduced Timelines.

## Market Overview

This myocardial in vitro screening platform provides relevant physiological stimuli enabling analysis of output metrics with direct clinical relevance to cardiac function. While drug discovery is robust and well-funded, a very low percentage of experimental drug candidates reach the marketplace as FDA-approved therapies. This translates into billions of dollars of sunk costs and many years of time and effort lost. Improving drug-screening platforms to more accurately capture physiologically relevant environments and functionality could significantly reduce temporal and monetary waste.

Clemson University researchers have developed an in vitro myocardial therapy screening platform possessing superior physiological relevance that enables clinically translatable metrics for therapy efficacy and cardiotoxicity evaluation.

## Technical Summary

The myocardial in vitro screening platform is a bioreactor system providing a physiologically relevant environment through precise control of the dynamic force-length relationship that occurs in the myocardial tissue constructs. This precise control recapitulates the pressure-volume mechanical relationships found in the native myocardium that are often evaluated in the progression or diagnosis of cardiac pathologies. The platform not only simulates this environment but also produces physiologically relevant metrics such as tissue stiffness, contractility, stroke work, and cardiac output curves which directly translate to clinically relevant treatment metrics. The nature of the technology platform is conducive for high-throughput therapy screening, in vitro research acceleration, cardiotoxicity assessment, and long-term personalized patient diagnostics and therapy selection.

### Application

This technology enables physiologically relevant cardiac in vitro screening for myocardial candidate therapies, or cardiotoxicity investigation, with clinically relevant output metrics.

### Development Stage

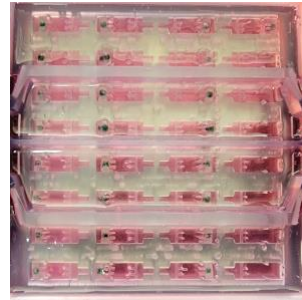
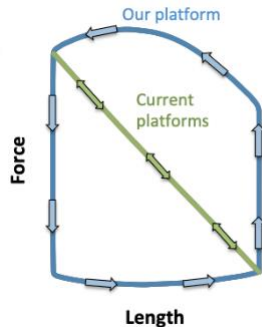
TRL4: Research Prototype

### Advantages

- Physiologically relevant mechanical environment, improving prediction of therapy success
- Physiologically relevant output metrics, communicating direct clinical translation
- Dynamic mechanical environment, providing versatility in desired testing conditions
- Tunable cardiac cycle, enabling patient-specific therapy development

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
Provisional	United States	63/236,936	NA	2021-003	William Richardson Samuel Coeyman Jonathan G. Heywood

Fig 1. Our platform simulates physiologically relevant force-length dynamics essential to providing a clinically relevant therapy screening environment superior to the linear relationship that current platforms provide.



## About the Inventor

### Dr. Will Richardson

Assistant Professor in the Department of Bioengineering at Clemson University



In 2016, Will joined Clemson University's Department of Bioengineering and started the Systems Mechanobiology Lab. The lab's expertise is matrix systems mechanobiology, focusing on the use of computational models to identify cell processes dominating matrix structural regulation, conducted alongside high-throughput cell-stretching experiments to test model predictions. The lab pursues a multi-scale, systems-level understanding of tissue fibrosis in order to engineer novel technologies for controlling fibrotic remodeling involved in various diseases. Dr. Richardson has received several honors for this work including an AHA Scientist Development Grant, the ASME Richard Skalak Award, the University of Arkansas College of Engineering Early Career Award, and the Dean's Endowed Professorship. His research specializes in computational systems biology, in vitro tissue systems, and data science for personalized medicine.

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