InvivoSciences, LLC ©

Discovery with a Human Touch

Cell and Tissue Mechanics

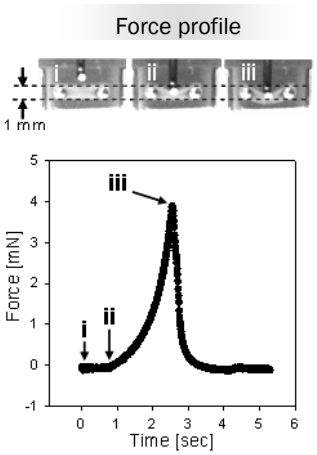
Application:

The Palpator™ rapidly and reproducibly quantifies cell and tissue mechanics (e.g., contractility and stiffness). The Palpator™ automatically positions its force probe on top of each tissue construct and slowly stretches the construct. Resistance force generated during the stretch is detected by the probe in real time and recorded as a force profile. A mathematical model is then used to fit the force profile to calculate the active cell contractile force and the passive stiffness of the tissue matrix.

Palpator™

Above: Palpator™ - automated tissue mechanics measuring device.

Force profile



Above right: Detailed view of a tissue being stretched and the measured force profile (i, ii, and iii indicate corresponding instances in force measurement).

Introduction:

Cell-generated forces regulate physiological functions as well as tissue and organ integrity. Disturbance of this regulation can result in fatal diseases such as fibrosis and atherosclerosis.

Traditionally, cellular contractile and traction forces are studied using single-cell techniques, while tissue mechanics are studied using *ex vivo* tissues. Neither approach, however, is readily amendable to high-throughput applications. Single-cell measurements require sophisticated instruments (e.g., Atomic Force Microscope, AFM) or microscopic technology; and two-dimensionally cultured cells do not entirely reflect the morphology or physiology of cells in nature. *Ex vivo* tissue and organ studies require surgical skills, animal sacrifice, and are not easily preserved for longer term (>24 hr) studies.

To address these limitations, InvivoSciences, LLC developed the Palpator™ to assess the mechanical properties of three-dimensional (3D) tissue constructs fabricated in Mini-Construct Chambers™ (MC-8™). Palpator™ can operate in high-throughput mode. Furthermore, the dimensions of the 3D tissue constructs conform to most conventional 96-well plate formats, allowing the incorporation of this tissue-based technology into existing cell-based assay systems (e.g., assessment of fluorescent indicators with a plate reader).

Technical Advantages:

- Automatically and rapidly assess multiple parameters of cell and tissue mechanics (i.e., contractile force and stiffness)
- Assess the mechanical properties of up to eight tissue constructs in less than three minutes
- Rapidly asses properties of cells grown in a more natural, *in vivo*—like microenvironment
- Easily combine cell and tissue mechanics assays with other high-throughput (96-well format) assay systems for drug efficacy and toxicity studies
- Reduce animal use by substituting *ex vivo* tissue and organ studies with this engineered tissue-based assay system

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