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Spheroid Toxicity Assay Utilizing Magnetic 3D Bioprinting

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Spheroid Toxicity Assay Utilizing Magnetic 3D Bioprinting*

Anore Pedalino and Ka Bian, PhD

Abstract

Analysis of cell cultures utilizing two-dimensional (2D) spheroid assays has been the standard to analyze toxicity screenings for decades, however the high cost and inefficiencies in producing in-vitro assays using this technique creates the need for more productive and cost-efficient methods. The newly introduced Magnetic 3D Bioprinting system addresses the shortcomings of the 2D systems. This method relies on magnetizing cells and rapidly printing them in a more organized formation, mimicking in-vitro environments and interaction. This study assesses the effectiveness of Magnetic 3D Bioprinting system in analyzing spheroid toxicity assays when compared to the 2D methods, we hypothesize that the cell cultures produced utilizing this system will result in superior detail, utility, and realistic representation of the in-vitro environment.

Cardiomyocytes and hepatocytes were mixed with NanoShuttle (1 u/ 10000 cells) for 2 hours to become magnetized. The cells were separated, counted, and redistributed to a cell repellent 384-well plate. The cells were left to interact to form a mature spheroid with ECM. Results showed that the cultures were successfully imaged and yielded viable spheroid samples with greater efficiency and cell interactions. After 15 minutes of printing, viability, spheroid size and cell count increased in a time dependent manner. Day 1: the surface area increased from 3.2 to 3.45×10^5 pixels in 12s; by day 7 the number increased to 8.18×10^5 pixels, while showing steady beating patterns

The Magnetic 3D Bioprinting system yielded cell cultures that revealed higher levels of activity, size, and interaction in the 3D environment.

KEYWORDS: Magnetic 3D Bioprinting Spheroid Toxicity Assay; 384-well plate

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This Abstract reflects the findings by a study performed by Division of Oncology, Department of Internal Medicine, University of Texas Health Science Center at Houston, Houston,

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