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3D tumor models for accurate testing of therapeutics

A method to create a 3D tumor model that accurately mimics both tumor behavior and environment for use in anti-cancer drug development.

IP Status: Pending US Patent; **Application #:** 16/674,815

Bridges the gap between 2D cell culture and animal models

The hunt for cancer therapies continues to be a major field of study in academia and industry. Unfortunately, many anti-cancer drugs with promising in vitro efficacy are found to be ineffective in vivo. This is due in large part to the limitations of current in vitro models. Conventional 2D monolayer cell cultures cannot accurately mimic characteristics of native tumor microenvironments, and current 3D cultured tumor cells, while able to more closely mimic natural behaviors, still cannot model the tumor microenvironment. To better utilize resources (including time, research animals and funds) and increase clinical translation, models that more accurately mimic both tumor environment and behavior are needed. To that end, researchers at the University of Minnesota developed a method to bioprint 3D tumor models with increased functionality and relevance, bridging the gap between 2D cell cultures and animal models.

Models tumor cell migration and other complex cell behaviors

The design incorporates the vasculature and stromal elements involved in tumor microenvironments (e.g., tumor cells, fibroblasts and blood vessels). The model also facilitates control of tumor cell migration and angiogenesis by creating chemical gradients of growth factors using 3D printed stimuli-responsive capsules. Altogether, this approach recapitulates physiological cell–to-cell, cell–to-extracellular matrix (ECM) and cell–to-chemical signal interactions with precise spatiotemporal resolution. In addition, the constructs consist of human cells, rendering them more clinically relevant and versatile with the option to incorporate a patient's own cells for precise selection of effective therapies.This innovation provides a powerful tool for understanding the mechanism of cancer metastasis, screening drugs and testing patient specific therapies.

Phase of Development

- In vitro proof of concept. Working prototype tested with several cell lines.

Key Benefits & Differentiators

Technology ID
2019-018

Category
Engineering & Physical Sciences/Materials
Life Sciences/Human Health
Life Sciences/Pharmaceuticals
Life Sciences/Research Tools

Learn more

- **Recapitulates real tumor environment:** 3D model recreates chemical, physical and spatiotemporal aspects of biological environments.
- **Mimics real tumor behavior:** Vasculature and chemical signals facilitate accurate modeling of the key steps of cancer dissemination (e.g., tumor invasion, intravasation, extravasation and angiogenesis).
- **Flexible for use in for a variety applications:** Modular design allows for incorporation of other cell types (cancer or patient specific) or a variety of chemical signals.

Applications

- Cancer research
- Cancer treatment
- Pharmaceuticals
- Drug testing/screening
- Identify therapeutic targets
- Clinically design and test patient-specific treatment

Researchers

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Publications

3D Bioprinted in Vitro Metastatic Models via Reconstruction of Tumor Microenvironments
Advanced Materials, 21 January 2019; Advanced Materials, 1806899

Ready for Licensing

This technology is now available for license! The University is excited to partner with industry to see this innovation reach its potential. Please contact us to share your business' needs and your licensing interests in this technology. The license is for the sale, manufacture or use of products claimed by the patents.