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Encapsulation Strategy for Creating Engineered 3D Cellular Models

Cell culture is a fundamental research tool for countless biological applications from drug discovery to cancer research and regenerative medicine. While two-dimensional (2D) cell culture is ubiquitous in research settings, it fails to adequately consider the natural three-dimensional (3D) microenvironment of cells. As newer and better 3D cell culture models are developed, important and complex cellular interactions can be observed and utilized to provide more accurate data about tumors, stem cells, cellular processes and diseases. While there are various platforms to generate 3D prototypes of tissues, they often face issues of size control, low yield or high costs.

Researchers at Arizona State University have developed a novel encapsulation strategy for creating engineered 3D tumor and stem cell models. This strategy rapidly and efficiently encapsulates pre-formed spheroids with minimal loss of cell viability. The size of the spheroid is fully tunable with formation within 24-72 hours after seeding. Fluorescent compositions can be incorporated into the spheroid for easy visualization and other bioactives can also be incorporated for cancer and stem cell applications. This strategy can be used to create spheroids for use in drug screening, disease modelling, regenerative medicine, stem cell differentiation, and much more.

This strategy efficiently encapsulates pre-formed spheroids in large quantities in a cost-efficient manner and as such would be useful in many biological applications.

Potential Applications

- Encapsulation of preformed cancer and stem cell spheroids
- Creating 3D in vitro models for cell culture
 - Studying and predicting cellular behaviors and interactions with the ECM (cancer cell relapse, resistance, dormancy, micrometastasis, etc.)
- Drug screening and discovery

- Drug delivery/cancer cell ablation
- Stem cell differentiation
- Disease modelling
- Regenerative medicine

Benefits and Advantages

- 80% viable cells after 72 hours post-encapsulation
- High throughput
- Low-cost and low-effort spheroid generation
- Requires no special equipment to coat the cell culture plates
- Tunable and homogeneously sized spheroids with 100% yield
- Rapid encapsulation process - ~15 minutes

For more information about this opportunity, please see

[Nanda - Thesis - 2020](#)

For more information about the inventor(s) and their research, please see

[Dr. Rege's departmental webpage](#)

[Dr. Rege's laboratory webpage](#)