Harnessing Biomimetic Materials to Induce Stemness in Rare Cells for Rapid and Reproducible Organoid Formation

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Abstract:

We have developed a series of biomimetic cell culture platforms based on zwitterionic polymeric films and extracellular matrix protein conjugated lipid bilayers to study cellular responses in relation to their microenvironments. In this talk, I will present our strategy of tunable materials design that aims to closely mimic the in vivo microenvironment of cells. We have discovered a series of surface constructs, the R3CE platform (Rapid, Reproducible Rare Cell 3D Expansion), that can induce and maintain the stemness of the cells, resulting in single cell derived 3D organoids within days. Clinical studies have demonstrated that extremely low abundant cells, such as patient derived primary tissues or circulating stem cells, can be reliably expanded for subsequent multiomic molecular analysis, in vitro drug testing and sufficient for the potential transplantation - a crucial step toward future regenerative medicine.