TissueSpec® Extracellular Matrix Substrates for 3D Cell Culture

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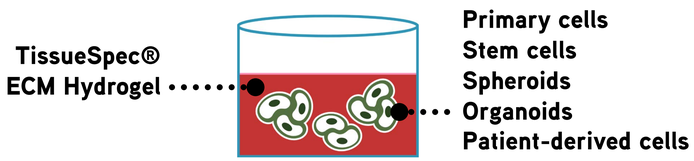
BIOMIMETIC IN VITRO MODELS

The extracellular matrix (ECM) is a critical regulator of cell function with physical and biochemical properties that are specific to each tissue. Conventional *in vitro* models lack the tissue-specific ECM molecules and mechanics of the cellular microenvironment and thus fail to be predictive.



TissueSpec® ECM substrates provide the physiologic 3D microenvironment for cells, resulting in more predictive *in vitro* models enabling the modulation of gene expression, proliferation, differentiation, and migration.

FEATURES

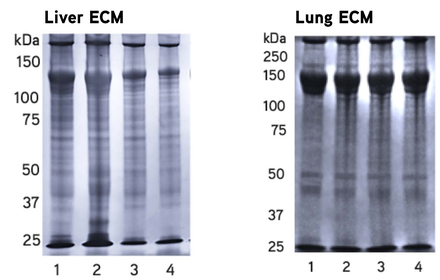
TissueSpec® ECM Composition and Consistency

Mass spec profile

ECM components*	Liver ECM Biomolecules	Lung ECM Biomolecules
collagens	type I-VI	type I–VI, VIII, IX, XI, XVI
laminins	subunit γ1	subunit α5, β2, γ1
glycoproteins	fibrillin 1, fibrillin 2, mucin 5AC, mucin 6	fibrillin 1, fibulin 5, nidogen
proteoglycans	heparan sulfate	heparan sulfate, aggrecan, hyaluronan
matrix-associated	albumin	elastin

*partial list of components

Proteomic analysis through mass spectrometry shows unique, tissue-specific signatures between liver and lung extracellular matrix biomolecules. Gel electrophoresis shows minimal variability of the protein profiles across multiple lots.



BENEFITS

Physiologically relevant
TissueSpec® ECM Hydrogels contain the full milieu of proteins & growth factors present in the native tissue

More accurate, predictive results
TissueSpec® ECM Hydrogels provide ideal conditions for maintaining cell phenotype, leading to more accurate results compared to other substrates

Standardized experiments
TissueSpec® ECM Hydrogels demonstrate consistent composition profiles across different lots, resulting in reproducible studies

Clinically translatable
TissueSpec® ECM Hydrogels facilitate downstream clinical translation because they contain tissue-specific ECM from medical grade swine tissues

3D CELL MODELS

Figure 1A.

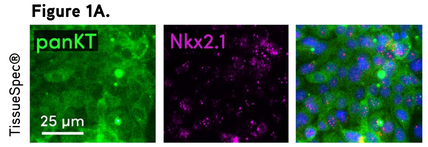
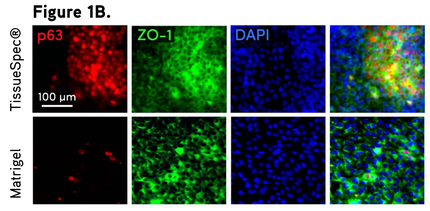


Figure 1B.



› **Methods:** Primary normal human bronchial epithelial (NHBE) cells were cultured on thin layers of TissueSpec® Lung ECM Hydrogel or Matrigel for 10 days.

› **Results:** TissueSpec® Lung ECM Hydrogel supported robust expression of normal lung epithelial cell markers (Figure 1A), significantly larger subpopulation of p63+ basal airway cells ($p<0.05$) compared to Matrigel (Figures 1B, 1C), and more organized, stratified luminal structures recapitulating the cellular architecture of the human airway ($p<0.05$) compared to Matrigel (Figure 1D).

Figure 1C.

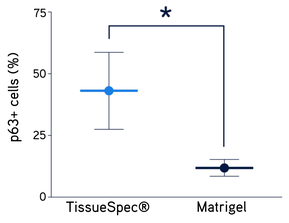
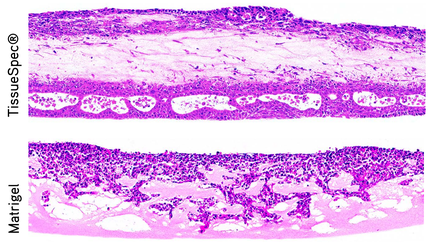
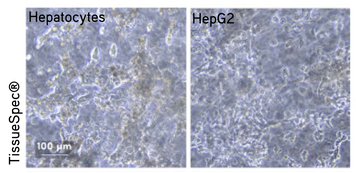


Figure 1D.



MICROPHYSIOLOGIC SYSTEMS

Figure 2A.



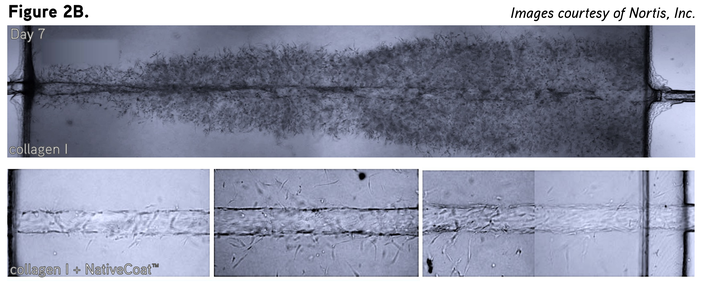
› **Methods:** Primary human hepatocytes and hepatocarcinoma (HepG2) cells were cultured in a thin layer of TissueSpec® Liver ECM Hydrogel.

› **Results:** TissueSpec® Liver ECM Hydrogel supported 3D structure formation of primary human hepatocytes and HepG2 cells (Figure 2A).

› **Methods:** Primary human liver sinusoidal endothelial cells were cultured in collagen type I-coated microfluidic channels in the presence, and in the absence, of NativeCoat™ Liver ECM Surface Coating.

› **Results:** Microfluidic channels exhibited uncontrolled outgrowth, loss of viability, and occlusion after 7 days without the addition of liver-specific extracellular matrix surface coatings (Figure 2B, top). The addition of NativeCoat™ Liver ECM Surface Coating supported attachment, survival, suitable growth, and viability of primary liver sinusoidal endothelial cells for 9 days (Figure 2B, bottom).

Figure 2B. *Images courtesy of Nortis, Inc.*



3D ORGANOID MODELS

› **Methods:** iPSC-derived human intestine organoids (iHIOs) were embedded in TissueSpec® Intestine ECM Hydrogel as spheroids and cultured for 27 days. The cultures were imaged using light microscopy to analyze organoid morphology.

› **Results:** During *in vitro* expansion, iPSC-derived human intestine organoids changed morphology, displayed budding and regions of spheroid outgrowth, and formed lumenized structures (Figures 3A, 3B). Arrows indicate regions of spheroid outgrowth.

Images courtesy of Dr. Chandan Guha, Department of Radiation Oncology, Albert Einstein College of Medicine

Figure 3A.

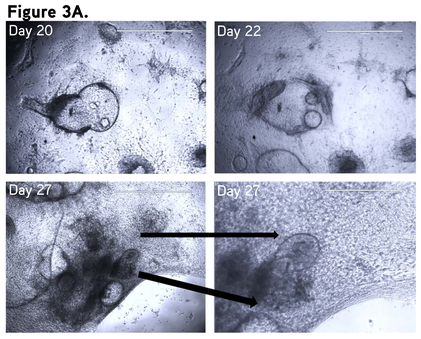
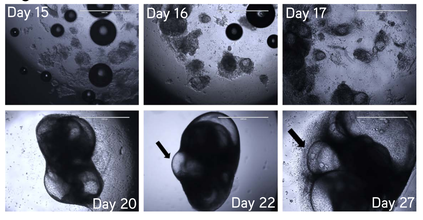


Figure 3B.



SUMMARY

We demonstrate that **TissueSpec® ECM** substrates are physiologic and suitable for *in vitro* 3D models.

XYLYX
the cell environment company