REGENERATIVE MEDICINE

Rapid 3D bladder model engineering

A new tissue-engineering method using submerged-culture conditions yields 3D bladder constructs that share histological and functional properties with native bladder within 15 days.

In their study, the team of researchers from the Université Laval in Québec, Canada, used a four-step production process. First, porcine bladder mesenchymal cells were seeded into a bovine type I collagen matrix. Once the matrix had polymerized, its surface was coated with porcine urine for 20 minutes. Next, porcine bladder urothelial cells were seeded onto the constructs and maintained in culture medium for 5–6 days after epithelialization. Last, the bladder models were cultured in a modified medium for 10 days, during which one group of constructs were again coated in urine for 20 minutes every other day (BM1). Two other groups were not coated: one of these remained in submerged-culture conditions (BM2), whereas the third was kept at the air–liquid interface (BM3).

Both BM1 and BM2 models developed a pseudostratified organization, but BM1 resulted in cellular polarity that was more similar to native urothelium. BM3 constructs had mixed polarities, resulting in weak cell cohesion. The expression profiles of bladder urothelium markers cytokeratin-14 and claudin-4 were most similar to native urothelium in BM1 samples, indicating appropriate differentiation and optimized organization of tight junctions when models were cultured with urine. In electron microscopy analyses, ultrastructural components were also most similar to native bladder in BM1 models, including apical surface modelling.

These bladder models could be useful for biological or pharmacological studies and might be adaptable for clinical use.

Clemens Thoma

Original article Bouhout, S. *et al.* A novel and faster method to obtain a differentiated three-dimensional tissue-engineered bladder. *J. Urol.* doi:10.1016/j.juro.2015.03.001