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Synthetic-natural polyblend nano-micro structured scaffolds for bladder tissue engineering applications

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Tissue engineering as a means of functional tissue fabrication or repair requires three-dimensional (3D) scaffolds serving as structural base (matrix) for cell attachment and proliferation. Thus far, both synthetic biodegradable materials such as PLA (polylactic acid), PLGA (Poly(Lactic-Co-Glycolic Acid)), and PCL (Polycaprolactone) and naturally derived polymers such as collagen, chitosan, fibrin and gelatin have been well used in tissue engineering and regeneration. Combination of synthetic and natural biomaterials for experimental investigations involving cells has attracted great deal of attention recently. Such a blend is expected to include the increased strength and durability of the synthetic polymer and the specific cell affinity of the natural one. We fabricated two different polyblend constructs (PCL-collagen and PLGA-collagen) to study their potential for bladder regeneration applications. Both constructs had fibrous stuructures similar to native ECM and the appliled fabrication methods were combination of knitted or electrospun sheet with Plastic Compression of collagen hydrogel (PC-coll). The constructs were evaluated by seeding of minced bladder mucosa, followed by *in vitro* proliferation. It was observed that cells migrated from the minced tissue particles and reorganized on the scaffolds. The attachment, viability and proliferation of migrated cells were studied using techniques of microscopy, MTT assay and histological analyses. It was observed that hybrid constructs were more hydrophylic and supported higher rates of cell proliferation compared to the scaffolds made from the syntethic polymer only. Moreover, they demonstrated better dimensional stability and mechanical strength compared to the PC-coll scaffold.

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