Polycaprolactone (PCL) based synthetic biopolymers for modern scaffold-based tissue engineering

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With the progress of technological advancement, biopolymers have drawn great attention in the modern regenerative therapy. Scaffold-based tissue engineering approach is truly promising in repairing and/or regenerating diseased/damaged tissues/organs. Natural biopolymers mimic the properties of natural extracellular matrices (ECM) of tissues. However, the natural biopolymers inherit a number of limitations that include large batch-to-batch variation, limited resources, poor mechanical performance etc. Synthetic biopolymers overcome these limitations offering a range of benefits such as enormous availability, high processability, controllable biomechanical properties and so on. Because of favourable viscoelastic property and low melting temperature, PCL has been one of the most contributing biopolymers to the field of tissue engineering. In this study, a set of polycaprolactone (PCL)-based biopolymers were employed to develop a scaffold family to cater for various tissue engineering applications as per necessity. The scaffolds were fabricated using a customized desktop robot based rapid prototyping (DRBRP) technique. Morphological and mechano-chemical characterizations were performed using scanning electron microscope (SEM) and *in vitro* degradation test, respectively. The biocompatibilities of the fabricated scaffolds were also tested via cell culture study. The results demonstrated great potential of the PCL-based synthetic biopolymers for advanced scaffold-based tissue engineering therapy.