Polyglycolic acid---an old polymer for new scaffolds and implants

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Abstract

Polyglycolide (PGA) is one of the earliest biodegradable polymers explored for biomedical application, date back 1970s for the first synthetic absorbable suture. PGA is highly crystalline polymer, endowing its high tensile modulus. In addition, PGA's rapid degradation via bulk hydrolysis makes it as appropriate materials for scaffolds in regenerative medicine. However, the application of PGA as scaffolds in tissue engineering is hampered by its high crystallinity (45-55%) property. PGA is insoluble in most organic solvents except the highly toxic solvent, hexafluoroisopropanol. Currently the practically feasible fabrication technique for porous PGA scaffolds is making PGA nonwoven fibers via melt-spinning, which has poor compressive properties and difficulty to control porosity, pore size and distribution. Working with the research partners, we explored a novel fabrication technique, supercritical carbon dioxide ($scCO_2$) assisted melt-foaming, to generate porous PGA scaffolds. In this talk, the uniqueness of the $scCO_2$ fabrication processing and the cellular response to the scaffolds will be demonstrated. The comparison study of in vitro and in vivo degradation and immunoresponse triggered by PGA degraded products will be presented. It is confirmed that PGA could be explored as unique scaffolds and implants through the new fabrication technique.

Biography

Dr Ying Yang is a Professor in biomaterials and tissue engineering. Her main research interests/activities are the design and fabrication of biomaterials to provoke desired cellular response at materials and cell interface including bioactive scaffolds for tissue engineering, anticoagulant surface for implanted biosensor, and the bioorganic metal surface for anti-fouling application. She has established systematic study methods including smart nanofiber applications, detection of variation of cell adhesion capacities and structures of collagen based matrices, in order to develop new strategies in regenerative medicine and clinical diagnostics. She has undertaken diverse clinical projects from colony growth of stem cells as a diagnosis assay for osteogenic potency assessment, pathological calcification of heart valves, the relation of pelvic organ prolapse and ageing, cartilage/blood vessel regeneration, eye models (glaucoma and retina) to pseudoislets generation. She also heavily engages in development of non-destructive and on-line monitoring systems for tissue engineering products and diagnostics. As the PI and co-PI, her research has been financially supported by BBSRC, EPSRC, European frame work FP5-7 and various charity. She has published over 130 full peer-reviewed papers, 11 chapters in books and filed 5 patents.