研究以電氣紡絲製備生物可降解性支架以及其用於軟骨組織工程的可能性

Fabrication and characterization of biodegradable scaffold by electrospinning and its potential for cartilage tissue engineering

中文摘要

本篇論文最主要的目的是在研究與發展軟骨組織工程。我們利用電氣紡絲的方式去製備 PLLA 及 PBSA scaffolds。首先，我們建立一個人類初代軟骨的培養模式。此外，我們應用這初代細胞培養模式，將細胞養在 PLLA scaffold、PBSA scaffold 及 TCPS(tissue culture polystyrene)上。我們發現在第一週，細胞在 PLLA 及 PBSA scaffold 上生長狀態比在 TCPS 上生長的差，但是，一週之後在 PLLA 及 PBSA scaffold 生長速度有增加。在利用 PLLA 及 PBSA scaffold 培養細胞 14 及 28 後，Aggrecan 及 Type II Collagen 的 mRNA 表現都有上升的趨勢。這個結果證實將細胞利用 3D 培養會使的軟骨細胞開始有 re-differentiation 的現象。在 SEM 的圖顯現出這樣的 scaffold 的結構能夠提供初代軟骨細胞貼附及生長。同時，這樣的結構也會維持細胞的特殊型態。如此一來，在未來利用 PLLA 及 PBSA scaffolds 修復軟骨是有可能性的。

英文摘要

The specific aim of this thesis is development and investigation of cartilage tissue engineering. We have fabricated scaffolds PLLA (Poly L-lactic acid) and PBSA (Poly butylene succinate-co-adipate) with electrospinning. We have set up human articular primary chondrocytes cell. Furthermore, we applied the primary cell culture, seeded on PLLA PBSA sacffold and TCPS (tissue culture polystyrene). We found that cells on the PLLA and PBSA scaffold grew worse than TCPS(tissue culture polystyrene) the first week but the growth rate increased after that. After 14 and 28 days in culture, mRNA expression of Aggrecan and collagen Type II was up-regulated in both PLLA and PBSA scaffolds. This result demonstrated that three-dimensional tissue culture of expanded articular chondrocytes initiated chondrocyte re-differentiation in vitro. Scanning electronic microscope images showed that scaffold structure provided for the adhesion and spreading of human primary chondrocyte cell. The scaffold maintained characteristic cell morphology at the same time. The PLLA and PBSA scaffolds, thus, have the potential to be further processed into three-dimensional scaffolds for cartilage tissue repair.