• 計畫中文名稱	以電氣紡絲製備片狀細胞工學用基質(I)		
• 計畫英文名稱	Fibrication of Scaffold for Cell Sheet Engineering by Electrospinning (I)		
• 系統編號	PB9709-3514	• 研究性質	應用研究
• 計畫編號	NSC97-2221-E038-011	• 研究方式	學術補助
• 主管機關	行政院國家科學委員會	• 研究期間	9708 ~ 9807
• 執行機構	臺北醫學大學醫學系		
• 年度	97 年	• 研究經費	1146 千元
• 研究領域	醫學工程		
• 研究人員	曾厚,何元順,歐耿良		
• 中文關鍵字	片狀細胞工學；聚異丙基丙烯醯胺；角膜上皮細胞；角質上皮細胞；組織工程		
• 英文關鍵字	cell sheet engineering； poly-N-isopropylacrylamide； cornea epithelial cell； keratinocyte； tissue engineering		
• 中文摘要	傳統做爲細胞培養基質的材料多爲 TCPS，但 TCPS 在進行培養細胞的繼代之時，都必需以蛋白酵素(EDTA-Trypsin)將細胞自附著的 TCPS 表面上取下，但因此一處理往往將好不容易建立好的細胞間質(ECM)破壞殆盡，且處理完成而取下的細胞懸浮液亦不利於進一步的應用，因此開始有聚異丙基丙烯醯胺、纖維蛋白素高分子及聚麩氨酸等方法製備片狀的細胞片狀物(Cell Sheet)被發展出來，此稱爲片狀細胞工學(Cell Sheet Engineering)。但在片狀細胞工學的各種處理方法都有其盲點，包括無法培養較大面積或較厚的片狀或塊狀組織，或無法精確地控制培養基質的分解時間。並且對上皮組織這種多層分化性的組織則必需還要結合 Air lifting 技術才能形成完整的上皮組織。因此本研究就是要結合聚異丙基丙烯醯胺與電氣紡絲再加上 Air lifting 技術形成新式片狀細胞工學，對上皮組織的多層且分化的片狀組織進行重建。而研究的方法是以 PET 與 PC 爲出發原料，以電氣紡絲技術製備成不同孔洞大小與孔洞率的電紡薄膜，再將一系列電紡薄膜以電漿處理後進行異丙基丙烯醯胺接枝聚合處理，此接枝完成的電紡薄膜也可測試各種包括通透性等等物理化學特性。活體外實驗則先以 NIH 3T3 fibroblast cell 先行測試薄膜的生物相容性及細胞貼附與增生性質，在得到較佳結果的薄膜後，再擇佳進行角膜及皮膚組織相關的 cell line 或 primary cells 進行貼附、增生或分化及剝離試驗，以期得到一個較佳的上皮組織工程模式。		
• 英文摘要	Traditionally, tissue culture polystyrene (TCPS) always is being as matrix material for cell culture, but an EDTA-trypsin aqueous solution also be used for a passage procedure which detach the cultured cell layer from TCPS when the cells fill in the TCPS culture		

	dish. Therefore, the established extracellular matrix is also destructed by the enzyme effect in same time, and the obtained cell suspension is also difficult to apply to the further applications. So, the cell sheet engineering system by a artificial materials, such as poly-N-isopropylacrylamide (pNIPAAm), fibrin polymer, poly gamma-glutamic acid … etc., were developed to improve the disadvantages as mention above. In the current cell sheet engineering system, some limits were found such as a larger or thicker tissue cannot reconstructed and a degradation time of matrix material were cannot precisely controlled. And, the air lifting technique must be used to obtain an integrated tissue structure in a multilayered and differentiated cell type such as epithelial cell moreover. The major purpose of this grant is to fabricate a series of porous electrospun membranes to culture a well-differentiated integrated epithelial cell sheet which combined three concepts including electrospinning, pNIPAAm and air lifting techniques. Practically, polyethylene terephthalate (PET) and polycarbonate (PC) will be used as starting materials to fabricate a series of porous membrane via electrospinning process first. The obtained electrospun membrane will treat by plasma to graft-polymerize with NIPAAm aqueous solution then. The pNIPAAm-grafted porous electrospun membrane will be obtained to evaluate some properties including physico-chemical, mechanical and permeability. The biocompatibility, cell adhesion and cell proliferation of these pNIPAAm-grafted porous electrospun membranes by NIH 3T3 cell will be carried in vitro. Furhtermore Statens Seruminstitut rabbit cornea (SIRC) cell line and human keratinocyte (HaCat) cell line will be seed onto these membranes to evaluate the cell adhesion, proliferation and detach function of the membranes. In final, primary rabbit cornea epithelial cells and primary human keratinocyte will be seed onto the optimized membranes to test the cell multilayerization, cell differentiation and cell detach function by the air lifting technique. The results of this grant will establish a better epithelial tissue engineering model may apply furthermore clinical applications.