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• 計畫中文名稱	以奈米級纖維狀薄膜仿波曼氏膜進行角膜上皮再生之細胞工學		
• 計畫英文名稱	Cell Engineering of Corneal Epethilium by a Bowman's Membrane-Mimic Nanofibrous Membrane		
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• 中文關鍵字	細胞工學; 角膜基底層; 角膜上皮細胞; 電氣紡絲		
• 英文關鍵字	Cell engineering; Corneal basement membrane; Corneal epithelial cell; Electrospinning		
• 中文摘要	近年來，利用羊膜爲基底，培養角膜上皮細胞、輪部幹原細胞，作爲角膜之傷口修復與重建，是眼科手術上的一大突破；另一方面，電氣紡絲技術因製程單純、製備容易也在近年組織工程領域中被廣泛研究與應用，而利用電氣紡絲製備出的纖維狀薄膜，其纖維型態又與去除上皮細胞層的羊膜基底層極爲相似；因此本研究欲結合此兩種概念應用於眼組織工程之上。實驗是以生物可吸收性高分子 PLLA、PBSA 及 PEO 爲原料，利用電氣紡絲技術，製備仿羊膜之纖維薄膜，製程中控制不同變因(射源、輸液速度、被覆材料、薄膜處理等)，製備表面性質不同之薄膜，探討角膜細胞之貼附、增生情形，並以細胞生長情形較佳之薄膜進行角膜細胞多層化試驗。薄膜性質以偏光顯微鏡、SEM、孔洞測定儀、DSC 分析；之後再擇優將角膜上皮細胞培養於電紡薄膜上，觀察細胞之貼附與增生速度。由實驗結果可知，若將幫浦輸液速度設定爲 2ml／hr 電紡 3%PLLA 之溶液，所製備之薄膜纖維直徑範圍界於 0.42~1.1μm，平均直徑爲 0.66μm，而利用 1N NaOH 處理薄膜 20 分鐘後，薄膜之纖維型態改變機械強力下降，但能幫助角膜細胞之貼附與增生，另外膠原蛋白披覆之方法亦能幫助 SIRC 的貼附與增生，但其機械強度較 NaOH 處理的薄膜強。		
• 英文摘要	Human amniotic membrane (HAM) has long been used as a surgical material for ophthalmic surgery. The HAM has two major components: the basement membrane and stroma. Of particular interest to us is the regeneration of the natural fibrous structure of HAM in order to facilitate applications in a biomedical field, such as use as tissue engineering scaffolds and wound dressings, because HAM has shown good biocompatibility and success as wound dressing material. With some biopolymer in hand, we envisaged an aqueous electrospinning process to produce fibers which can be taken as mimetics of natural HAM. Hydrophilic polymer (PEO or PEG) will be used to improve the processability of		

mucopolysaccharide such as chitosan, hyaluronate …etc., because mucopolysaccharide itself cannot be electrospun as a result of low solution viscosity. On the other hand, electrospinning is an easy and simple technique for polymer process. Its nonwoven fibrics architecture is almost similar human acellular amniotic membrane. Our study combined these two concepts for eye tissue engineering. The electrospinning technique was utilized, and some bioabsorable polymers (PLLA, PBSA, PEO) were used to fabricate fine-fibrous membranes. We also prepared membranes with different surface features by controlling factors (two-feeding, feeding rate, coating proteins, and NaOH treated). To investigated which one is better for corneal epithelial cells attach and proliferating ability. The structure and morphology of electrospun membranes were investigated by scanning electron microscopy (SEM), differential scanning calorimeter (DSC), and X-ray diffraction scattering, contact angle detector. SIRC were cultured on the original and modified membrane and the cell morphology, attachment, proliferation were studied. We demonstrated that PLLA solution (3%) in a mixture solvent of Dichloromethane／Dimethylformamide (9:1) was electrospun into non-woven fiber mesh with the fiber diameter ranging from 0.42 to 1.1 .mu.m. PLLA and PBSA membranes treated in 1N NaOH solution for 20 minutes can improve cell attach and proliferation ability. Stretch stress test revealed significant differences between treated and non-treated mesh. And NaOH-treated scaffolds exhibited more surface roughness. The collagen coating method also can obviously improve cell attach and proliferation of the SIRC on the electrospinning membranes. But their mechanical strength is better than NaOH-treated membrane.