# 전기방사된 sweet polyester 멤브레인 : 조직 공학용 scaffold

마더버 프라사더 버저가이, 산토쉬 아리알*, 김관우*, 고정안, 김학용**
전북대학교 바이오나노시스템공학과, *전북대학교 헬스케어기술개발 사업단,
**전북대학교 섬유소재시스템공학과

# Sweet Polyester Electrospun Membrane: Scaffold for Tissue Engineering

**Madhab Prasad Bajgai, Santosh Aryal*, Kwan-Woo Kim*, Jung-An Ko, Hak yong Kim****
*Department of Bionano System Engineering, Chonbuk National University, Jeonju, Korea*
**Center for Healthcare Technology Development, Chonbuk National University, Jeonju, Korea*
***Department of Textile Engineering, Chonbuk National University, Jeonju, Korea*

## 1. Introduction

Electrospinning has been employed as a versatile technique to produce polymeric fibrous substrates for cell culture and tissue engineering applications[1,2]. Biodegradable polymers including polylactide (PLA), polyglycolide (PGA), poly (lactide-co-glycolide) (PLGA) and poly (ε-caprolactone) (PCL) are the frequently used polymers in biomedical fields due to their properties such as durability, stress resistance, flexibility, and good elasticity[3]. However, cell affinity towards synthetic polymer is generally poor due to their low hydrophilicity and lack of surface cell recognition sites. So, there is an urgent need to develop hydrophilicity of hydrophobic biodegradable and biocompatible polymers to make an ideal scaffold for tissue engineering. For such purpose, polysaccharides can be the best materials since their carbohydrate moieties interact with or are integral components of many cell adhesion molecules and matrix glycoproteins[4,5]. Focusing this issue, we select PCL grafted dextran (PGD) as a block copolymer to overcome the hydrophobicity of PCL and poor mechanical properties of dextran so as to make a better scaffold .

## 2. Materials and method

Dextran (mol wt 8500-11500), ε-caprolactone(ε-CL), hexamethyldisilazane(HMDS), triethylamine, and stannous 2-ethyl hexanoate [Sn (oct) $_2$] were purchased from Sigma-Aldrich Inc., USA. All the other chemicals used in this research were purchased from Showa Chemical Ltd, Japan. Dextran was dissolved in DMSO (10 wt.% ) along with the addition of desired quantity of triethylamine and HMDS under a nitrogen flow at 60 $^0$C for 48 h . For the ring-opening polymerization, remaining hydroxyl group of silylated dextran acts as a macro initiator and stannous octoate [Sn (oct) $_2$] as a catalyst maintained at 130 $^0$C for 72h with subsequent deprotection by 0.1M HCl. The PCL weight fraction ($F_{PCL}$) in the graft copolymers were determined by $^1$H NMR. Out of three different products, PGD-50 ( 25% in MC/DMF) has been selected for the fabrication of matrix and cell matrix interaction with mouse osteoblast like cells, MC-3T3 and the numbers of viable cells were determined at 24, 48, 72, and 96 h by the MTT assay.

## 3. Results and discussion

After polymerization and successive deprotection in mild acidic condition, graft copolymers were dried under vacuum and characterized by $^1$H NMR[1,2]. The four large peaks that originated from the repeated units of PCL at δ= 1.4, 1.6, 2.3 and 4.1 ppm and one triplet at δ=3.5 ppm were obtained. The inclusion of dextran has been confirmed with the appearance of glycosidic protons at δ= 3.7 ppm. Out of three different products of PGD, PGD-50 has been selected for the fabrication of matrix by the process of electrospinning and subsequent cell culture. The cell seeded on the porous scaffold were found to have an appropriate interaction and better cell spreading with their environment. The reason behind might be contact guidance phenomenon derived from the influence of material surface topography organized by two different phases on the actin cytoskeleton, focal adhesion, and microtubule of the cells or from the biomechanical equilibrium between cells and materials surface. From this evidence, it indicates that PGD-50 matrix structures positively promote cell–matrix interactions and inter cell communication.

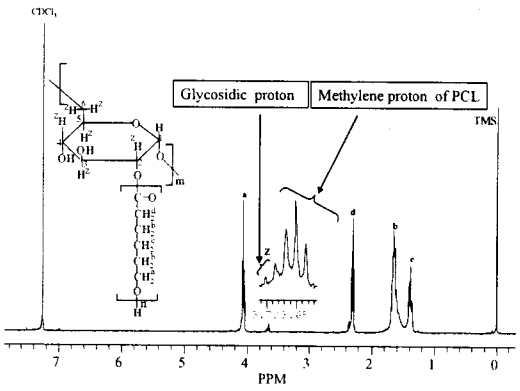


Fig.1. $^1$HNMR spectrums of PGD graft copolymer

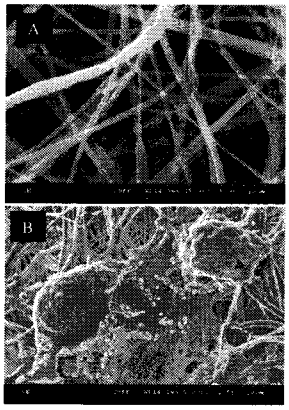


Fig.2. The Bio-SEM images A. electrospun matrix of PGD-50, B. matrix after 72 h of MC-3T3 cell culture.

## 4. Conclusions

In this study, we prepared the new matrix of poly (ε- caprolactone) grafted dextran .The fabricated PGD-50 matrix was highly porous and considerable mechanical properties for the application of ECM in tissue engineering. Furthermore, our preliminary results like biocompatibility and cell-matrix interaction of were highly promisiable biological indicator, so, proposed for tissue engineering application.


### 4. Acknowledgement

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