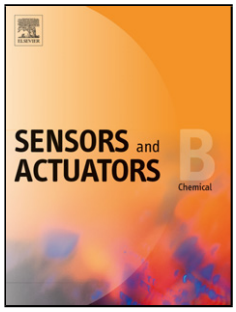

Title: Enhanced cellular distribution and infiltration in a wet electrospun three-dimensional fibrous scaffold using eccentric rotation-based hydrodynamic conditions

Author: Joonseong Heo Hyoryung Nam Dongha Hwang Seong J. Cho Sung-Young Jung Dong-Woo Cho Jin-Hyung Shim Geunbae Lim

PII: S0925-4005(15)30613-4
DOI: http://dx.doi.org/doi:10.1016/j.snb.2015.11.030
Reference: SNB 19288

To appear in: *Sensors and Actuators B*

Received date: 1-6-2015
Revised date: 28-9-2015
Accepted date: 5-11-2015

Please cite this article as: Joonseong Heo, Hyoryung Nam, Dongha Hwang, Seong J. Cho, Sung-Young Jung, Dong-Woo Cho, Jin-Hyung Shim, Geunbae Lim, Enhanced cellular distribution and infiltration in a wet electrospun three-dimensional fibrous scaffold using eccentric rotation-based hydrodynamic conditions, *Sensors & Actuators: B. Chemical* (2015), http://dx.doi.org/10.1016/j.snb.2015.11.030

Enhanced cellular distribution and infiltration in a wet electrospun three-dimensional fibrous scaffold using eccentric rotation-based hydrodynamic conditions

Joonseong Heo[1,a], Hyoryung Nam[1,b], Dongha Hwang[a], Seong J. Cho[c], Sung-Young Jung[a], Dong-Woo Cho[a], Jin-Hyung Shim[d,*], Geunbae Lim[a,*]

[a] *Department of Mechanical Engineering, Pohang University of Science and Technology, San 31, Pohang, Gyeongbuk, Republic of Korea*
[b] *Department of Integrative Bioscience and Biotechnology, Pohang University of Science and Technology, San 31, Pohang, Gyeongbuk, Republic of Korea*
[c] *School of Mechanical Engineering, Chungnam National University, 99 Daehak-ro, Daejeon, Chungnam, Republic of Korea*
[d] *Department of Mechanical Engineering, Korea Polytechnic University, 237 Sangidaehak-Ro, Siheung, Gyeonggi-do, Republic of Korea*

Abstract

Electrospinning technology is a versatile method for fabricating three-dimensional (3D) nanofibrous scaffolds using a wide range of polymeric materials for tissue engineering and regenerative medicine. However, a major concern regarding 3D electrospun scaffolds is that the densely packed layers hinder an even cellular distribution and in-depth infiltration. Here, we describe a new ′all-at-once′ method enabling scaffold fabrication and cell seeding simultaneously, in which the medium bath containing cells is rotated eccentrically at high speed ($>$ 1500 rpm). The unstable flow of culture medium under hydrodynamic conditions resulted in a skein-shaped 3D structure and enhanced the even cellular distribution and in-depth infiltration. Cellular distribution and infiltration analyses confirmed that our method was superior to static and dynamic seeding methods. Moreover, we showed that our method facilitated long-term (14 days) proliferation.

Keywords: `scaffold`, `electrospun`, `three-dimensional`, `eccentric`

*Corresponding author
Email address: `happyshim@kpu.ac.kr (Jin-Hyung Shim), limmems@postech.ac.kr` (Geunbae Lim)
[1] Joonseong Heo, Hyoryung Nam are contributed equally to this work.