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15th International Biotechnology Symposium and Exhibition

September 16 (Sun) - 21 (Fri), 2012

EXCO, Daegu, Republic of Korea

Innovative Biotechnology for a Green World and Beyond

- Hosted by

KSBB The Korean Society for Biotechnology and Bioengineering

- Co-hosted by

KIChE The Korean Institute of Chemical Engineers

KMB The Korean Society for Microbiology and Biotechnology

KoSFoST Korean Society of Food Science and Technology

PSKOR The Pharmaceutical Society of Korea

- Sponsored by

IUPAC International Union of Pure and Applied Chemistry

AFOB

Ministry of Education, Science and Technology

Colorful DAEGU

eRide GyeongBuk

Korea Tourism Organization

Foodpolis Korea National Food Cluster

koreaBio Korea Biotechnology Industry Organization

TUESDAY, SEPTEMBER 18, 2012

Room 322B

10:10-12:10

Medical Biotechnology

Topic: Antioxidants and Signal Transduction

[Co-organized by the Society for Biotechnology, Japan]

Chair: **Seiichi Matsugo** (Kanazawa University, Japan)

10:10~10:34 **Seiichi Matsugo** (Kanazawa University, Japan) **- Invited**
Neuroprotective effects of lipoic acid

10:34~10:58 **Jung-Ae Kim** (Yeungnam University, Korea) **- Invited**
Role of NADPH oxidase in anti-angiogenic and anti-inflammatory effects of synthetic compounds

10:58~11:22 **Gerald Rimbach** (University of Kiel, Germany) **- Invited**
Impact of the apoE genotype and dietary plant bioactives on oxidant/antioxidant status, Nrf2 signalling, inflammation and disease risk – studies in cultured cells, mice, and humans

11:22~11:46 **Tetsuya Konishi** (Niigata University of Pharmacy and Applied Life Sciences, Japan) **- Invited**
Neuroprotective function of schisandrin B isolated from *Schisandra chinensis*

11:46~12:10 **Hyeyoung Kim** (Yonsei University, Korea) **- Invited**
Antioxidant and *Helicobacter pylori-induced DNA* damage response in gastric epithelial cells

13:30-15:30

Topic: Tissue Engineering

Chairs: **Wei Liu** (Shanghai Jiao Tong University School of Medicine, China), **Kelvin Yeung** (The University of Hong Kong, HongKong)

13:30~14:00 **Wei Liu** (Shanghai Jiaotong University School of Medicine, China) **- Invited**
Tissue engineering research: translation from research to clinical trail and production development

14:00~14:30 **Kelvin Yeung** (The University of Hong Kong, Hong Kong) **- Invited**
Tenogenic differentiation of human mesenchymal stem cells on novel bio-imprinted scaffolds

14:30~14:45 **Soonjo Kwon** (Utah State University, USA)
Effects of MWCNT-collagen scaffolds on mesenchymal stem cells towards osteogenic differentiation

14:45~15:00 **Dong Soo Hwang** (POSTECH, Korea)
Complex coacervation-based coatings for titanium: hyaluronic acid and recombinant mussel adhesive protein promote osteoblast cell proliferation

15:00~15:15 **Marcele Fonseca Passos** (UNICAMP, Brazil)
pHEMA/ silica composite for use in tissue engineering

15:15~15:30 **Soojeong Shin** (Seoul National University, Korea)
Conformal microencapsulation of pancreatic islets and 3-D structured bio-artificial pancreas using encapsulated islets

17:00-19:00

Topic: Tissue Engineering for Regenerative Medicine

[Co-organized by the Society for Biotechnology, Japan]

Chairs: **Guoping Chen** (National Institute for Materials Science, Japan), **Yoshihiro Ito** (RIKEN, Japan)

17:00~17:24 **Kevin E. Healy** (University of California-Berkeley, USA) **- Invited**
Bioinspired materials that direct stem cell fate and tissue regeneration

17:24~17:48 **Akon Higuchi** (National Central University, Taiwan) **- Invited**
Effect of the surface density of nanosegments immobilized on culture dishes on *ex vivo* expansion of hematopoietic stem and progenitor cells from umbilical cord blood

17:48~18:12 **Peibiao Zhang** (Changchun Institute of Applied Chemistry, China) **- Invited**
Biodegradable synthetic nanocomposite for bone regeneration

18:12~18:36 **Yoshihiro Ito** (RIKEN Advanced Science Institute, Japan) **- Invited**
Feeder cells support the culture of induced pluripotent stem cells even after chemical fixation

Reference No. : Temp_IS-S6-0111

Tenogenic differentiation of human mesenchymal stem cells on novel bio-imprinted scaffolds

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Introduction: Cell-based therapy is a promising approach for tendon repair. Tenocytes can be differentiated from mesenchymal stem cells (MSC), but most current protocols for producing tenocytes are not robust and convenient enough to meet practical demands. Increasing evidence shows that cells are exposed in vivo to a tissue niche that comprises of precisely regulated biochemical and physical signals. This study reports the fabrication of the tendon tissue niche, through the novel use of bio-imprinting, and explores the use of this material to direct the tenogenic differentiation of human MSC in vitro.

Methods: Factors that constitute to the function of a natural cell niche in tendon was first determined, and the bioimprint was fabricated. To determine the biophysical factors e.g. topography, biochemical cues e.g. protein composition and stiffness that constitute the cell niche within tendon TME, a novel experimental model based on tissue cryosection and PDMS bioimprinting was used. Briefly, the histological sections of bovine Achilles tendons were prepared along the longitudinal and cross-sectional axes. Biophysical features e.g. topography and stiffness presented on the section surface were characterized by scanning EM and AFM. To copy these features, PDMS was polymerised on these sections. The resulting block was then used as a mould on which replica of tendon sections were synthesised. After collagen coating, these replica were used as cell culture scaffold for MSC. Differentiation of MSC was monitored by using antibody markers.

Results and Discussion: The PDMS bio-imprint scaffolds were shown to faithfully replicate, on nanoscale, the surface topography of the genuine tendon sections. MSC can adhere to and spread on these scaffolds effectively. Interestingly, cell morphology was highly dependent on biophysical details of these scaffolds. MSC were highly elongated and aligned on PDMS replicas of longitudinal sections (LS) of tendon, but not on those of cross sections. Importantly, a significantly higher level of tenomodulin (TNMD) was expressed on the LS replica compared to CS replica and to glass surfaces,, suggesting that

the LS contains biological cues that instruct MSCs to commit to the tenogenic lineage.
Conclusion: Our study has demonstrated both biophysical and biochemical factors in extracellular microenvironment are important to the tenogenic differentiation of MSCs. Also, the bio-imprinting technique is a promising approach to copy the biophysical features from natural tissue microenvironment. When combined with biochemical coating, this scaffold can be used as a biomimetic cell culture surface for MSC, allowing effective expansion of tenocytes in-vitro.

keywords : Tendon, Mesenchymal stem cells, Tissue engineering, Microenvironment, Biomimetic material