http://dx.doi.org/10.4172/2157-7552.S1.010

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference on
Tissue Science & Regenerative Medicine
August 26-28, 2013 DoubleTree by Hilton, Raleigh, NC, USA

Non-destructive real-time imaging of tissue regeneration

Shay Soker
Wake Forest School of Medicine, USA

Studies in tissue engineering are limited to invasive or destructive analytical techniques such as histology, which requires sacrificing the tissue construct at fixed time points. In the current study we proposed to overcome this difficulty by directly integrating fiber optical devices into TE scaffolds in order to monitor tissue development non-destructively and in real-time. Our approach is based on embedding silica micro-imaging channels (MICs) into scaffolds, seeded with fluorescently labeled cells, where each MIC serves as a localized optical sensing device. PDLLA scaffolds, embedded with MICs, were seeded with GFP-labeled human microvascular endothelial cells (GFP-EC) on one side of the scaffold. The scaffold was then sealed into a bioreactor with transparent windows that allow the collection of fluorescence signals. Fluorescence excitation light was delivered by inserting an optical fiber-based micro-mirror into the MIC. While rotating and scanning the micro-mirror, we used a highly sensitive EM-CCD camera to collect a series of fluorescence responses that transmitted through the optically opaque scaffold. Direct images were taken first in order to determine the spatial distribution of GFP-EC. Next, we scanned the same area with the fiber-based micro-mirror. After processing the EM-CCD camera responses through a reconstruction algorithm, we obtained the reconstructed image. This result corresponds to imaging such cells through a 500μm-thick opaque scaffold. The distribution of the fluorescent cells was reconstructed from such fluorescent responses via signal processing. These results demonstrate a direct synergy of fiber optics and tissue engineering that can be extended to developmental biology applications.

Biography

Shay Soker is a Professor of Regenerative Medicine at the Wake Forest Institute for Regenerative medicine. He received his Ph.D. from the Technion-Israel Institute for Technology and was postdoctoral trainee and an Assistant Professor at the Children's Hospital Boston. His research integrates principles of vascular biology in regenerative medicine applications and the biology of stem and progenitors cells that are needed for tissue repair and regeneration. He also studies the biochemical properties of natural materials for tissue engineering. He has authored more than 100 scientific publications and reviews, and has written chapters in several books.

ssoker@wakehealth.edu