Wei Seong Toh, J Cell Sci Ther 2011, 2:4
doi: http://dx.doi.org/10.4172/2157-7013.S1.08

OMICS Group Conferences
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International Conference & Exhibition on
Cell Science & Stem Cell Research

29 Nov - 1 Dec 2011 Philadelphia Airport Marriott, USA

Probing the stem cell microenvironment in tunable extracellular matrices for tissue engineering and regeneration

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The extracellular matrix (ECM) plays a crucial role in both stem cell self-renewal and differentiation. In stem cell-based therapies, proper regulation of self-renewal and differentiation determines the outcome of tissue regeneration and subsequent normal tissue functioning and homeostasis. Therefore, ECM-based biomaterial systems have the greatest advantage of being able to provide the natural stem cell microenvironments suitable for cellular adhesion, migration, proliferation and differentiation. Two novel injectable ECM-based biomaterials (Hyaluronic Acid-Tyramine and Gelatin-Hydroxyphenylpropionic Acid), which can be covalently cross-linked *in vivo* via an enzyme-mediated oxidative coupling process and feature independent tuning of mechanical properties and gelation rates, have recently been developed for drug delivery and tissue engineering applications. In this presentation, we will be describing the use of these ECM-based biomaterials as *in vitro* systems for the construction of stem cell microenvironments. Of interest, modulation of stem cell differentiation along musculoskeletal and neural lineages in these systems will be discussed.

Biography

Wei Seong Toh received his B.Sc. from University of Melbourne, Australia in 2003. He was later funded by NUS Research Scholarship and President Graduate Fellowship for his Ph.D. (2006-2010) studies in National University of Singapore (NUS). Since 2011, he joined Harvard Medical School, Brigham and Women's Hospital as a Post-Doctoral Research Fellow, supported by A*STAR International Fellowship, Agency for Science, Technology and Research (A*STAR) Singapore. His research interests include the application of biomaterials to modulate stem cell microenvironments for tissue engineering and regeneration. He has published more than 15 publications in reputed international journals and authored 6 invited reviews/book chapters.