Department of Mechanical and Biomedical Engineering

Seminar Series

Living Hyaline Cartilage Graft (LhCG) for Articular Cartilage Repair: Regeneration and Anti-inflammation in situ, Drug Evaluation in vitro

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Date	April 26, 2018 (Thursday)
Time	2:30pm – 3:30pm
Venue	Room B6619 (MBE Conference Room), 6/F, Yeung Kin Man Academic Building

Abstract

Articular hyaline cartilage, a tissue articulating skeleton at joints, is highly prone to damages caused by trauma, diseases and ageing; whereas once injured, its self-regeneration is difficult and slow due to the avascular nature. Under arthritic conditions, the cartilage lesion is, more or less, induced and/or complicated by autoimmune or secondary inflammation. To repair and regenerate damaged articular cartilage, we have innovatively developed a continuous methodology to directly set up a macro-scaled 3D living hyaline cartilage graft (LhCG) with the aid of a biomaterial-based interim scaffolding system - alginate hydrogel in which chondrocytes are accommodated and guided to grow into scattered micro-tissues and further interconnecting them into an integrated 3D macro-network made of pure tissues, interpenetrating with the biomaterial-based scaffolds. By then, alginate hydrogel as an interim scaffold is no longer necessary and thus is completely and noninvasively removed by simple citric leaching treatment so that a pure cartilaginous tissue and chondrocytes based tangible piece of living cartilage graft is created. Owing to the intrinsic non-cell-adhesive property of hydrogel scaffolds, hyaline chondrocytes' phenotype is always preserved throughout the

whole procedure. Hence, after the removal of alginate scaffold, the resultant porous sponge-like LhCG of high purity and genuineness is guaranteed. Furthermore, good osteochondral defect healing and complete integration with adjacent native cartilage in in-situ implantation of LhCG samples in large animal models demonstrated the competence of LhCG as a cartilage graft. Upon this living cells-based graft, as an open platform, LhCG can be pre-transduced with various transgenes or pre-treated to set up in vitro pathological models - specifically functioning for in-situ homing factor releasing to recruit host endogenous stem/progenitor so as to enhance therapeutic regeneration, in-situ anti-inflammatory transgenic drug releasing to prevent pain and further damage, and also functioning as a 3D engineered biomimetic cartilaginous tissue model for anti-osteoarthritic (OA) drug evaluation in vitro.

About the Speaker

Dr. Dong-An Wang is an Associate Professor (with tenure) and Program Director of Bioengineering in School of Chemical and Biomedical Engineering (SCBE), Nanyang Technological University (NTU) in Singapore. Dr. Wang's research focuses on biomaterials, tissue engineering, regenerative medicine and molecular pharmaceutics with specialties of functional biomaterials for tissue engineering and therapeutic cell delivery; nucleic acid delivery for therapeutic engineering; applications of stem cells for translational medicine; and engineered biomimetic tissue platforms for in vitro drug evaluation. As a major/leading author, Dr. Wang has published over 100 high quality journal papers including Nature Materials, Advanced Functional Materials, Scientific Reports, Biomaterials etc., some of which are either editorially quoted by Science, Nature Materials, etc.; or, featured as cover stories. Dr. Wang has been often invited as a theme editor for a number of top journals, such as Advanced Drug Delivery Reviews, Molecular Pharmaceutics etc.

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All are Welcome!