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CONSTRUCTION OF HUMAN CHONDROCYTE SHEETS ON CANCELLOUS BONE TO TREAT CARTILAGE DEFECTS

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Human chondrocyte sheets have attracted attention as tissue-engineered cartilage for the treatment of articular cartilage defects. However, the process of transferring the human chondrocyte sheets to cartilage defects is complicated because the cell sheets are thin and fragile. This study investigated whether human chondrocyte sheets could adhere to human cancellous bone and express cartilage-specific markers. Human chondrocyte sheets were constructed using osteoarthritic chondrocytes and temperature-responsive culture plates. Monolayer and triple-layered chondrocyte sheets were placed on the top of cancellous bones and cultured in basal medium. The expressions of cartilage surface (lubricin) and hypertrophic chondrocyte (collagen type X) markers in the tissue structure were observed by immunofluorescence staining. After one month, all the chondrocyte sheets were firmly attached, with growth inside the cancellous bones, as shown by fluorescence staining of the nuclei and stress fibers. The cells also adhered and proliferated to reach confluence on the tissue culture surface outside the cancellous bone, indicating cell growth and viability. Moreover, the expressions of lubricin and collagen type X were found in chondrocyte cultures. Our results indicated that the human chondrocyte sheets showed potential to adhere to cancellous bone with expression of cartilage surface markers; although hypertrophic markers were found in the cultures as we used osteoarthritic chondrocytes. Attachment of human chondrocyte sheets to cancellous bone could enhance the thickness and support the structure of engineered cartilage tissue transferred to the defective areas. This would be beneficial for researchers to develop a protocol for the treatment of articular cartilage defects.

Biography

Sopita Wongin is a posdoctoral fellow in Biological Engineering Program, Faculty of Engineering, King Mongkut's University of Technology Thonburi. Sopita got a scholarship from the Royal Golden Julilee PhD Program and completed her PhD at King Mongkut's University of Technology Thonburi, Thailand in 2017. During her PhD, she worked as a special research student for a year in Laboratory of BioProcess Systems Engineering (BPSE), Department of Biotechnology, Graduate School of Engineering, Osaka University, Japan.

Her research interests lie in the area of cell sheet technology, tissue engineering and advanced cell technology. Her recent publications include *Chondrogenesis and Hypertrophy in Response to Aggregate Behaviors of Human Mesenchymal Stem Cells on a Dendrimer-Immobilized Surface (2017), Effect of Cell Sheet Manipulation Techniques on The Expression of Collagen Type II by Altering Stress Fiber Formation (2018) and Maintenance of the human chondrocyte phenotype on a dendrimer-immobilized surface for chondrocyte sheet engineering (2018).*

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