Growth factor combination for chondrogenic induction from human mesenchymal stem cell

Nitaya Indrawattana, a,b,d Guoping Chen, a,c Mika Tadokoro, a Linzi H. Shann, a Hajime Ohgushi, a Tetsuya Tateishi, c Junzo Tanaka, c and Ahnond Bunyaratvejd, e

a Research Institute for Cell Engineering, National Institute of Advanced Industrial Science and Technology, 3-11-46 Nakoji, Amagasaki, Hyogo 661-0974, Japan
b Department of Clinical Chemistry, Faculty of Medical Technology, Mahidol University, Thailand
c Biomaterials Center, National Institute for Materials Science, 1-1 Namiki, Tsukuba, Ibaraki 305-0044, Japan
d Cell Engineering and Tissue Growth, Institute of Science and Technology for Research and Development, Mahidol University, Phuttamonthon, Salaya, Nakhonpathom 73110, Thailand
e Department of Pathology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand

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Abstract

During the last decade, many strategies for cartilage engineering have been emerging. Stem cell induction is one of the possible approaches for cartilage engineering. The mesenchymal stem cells (MSCs) with their pluripotency and availability have been demonstrated to be an attractive cell source. It needs the stimulation with cell growth factors to make the multipluripotent MSCs differentiate into chondrogenic lineage. We have shown particular patterns of in vitro chondrogenesis induction on human bone marrow MSCs (hBMSCs) by cycling the growth factors. The pellet cultures of hBMSCs were prepared for chondrogenic induction. Growth factors: TGF-β3, BMP-6, and IGF-1 were used in combination for cell induction. Gene expression, histology, immunohistology, and real-time PCR methods were measured on days 21 after cell induction. As shown by histology and immunohistology, the induced cells have shown the feature of chondrocytes in their morphology and extracellular matrix in both inducing patterns of combination and cycling induction. Moreover, the real-time PCR assay has shown the expression of gene markers of chondrogenesis, collagen type II and aggrecan. This study has demonstrated that cartilage tissue can be created from bone marrow mesenchymal stem cells. Interestingly, the combined growth factors TGF-β3 and BMP-6 or TGF-β3 and IGF-1 were more effective for chondrogenesis induction as shown by the real-time PCR assay. The combination of these growth factors may be the important key for in vitro chondrogenesis induction.

Keywords: Cartilage; Chondrogenesis; Growth factors; Mesenchymal stem cell; Tissue engineering; Transforming growth factor

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