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Fluid flow shear stress induces mesenchymal stem cell derived osteogenic differentiation in polymer scaffold guided bone regeneration

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Bone tissue engineering aims to develop engineered bone tissue to substitute the conventional bone graft and to produce an unlimited supply of engineered constructs to meet the present global demand. To achieve this, culturing the cells on biocompatible three-dimensional (3D) scaffold is essential. The major limitations for functional tissue generation in 3D culture such as limited knowledge on the physicochemical parameters, regulatory mechanism of the tissue development and the cost of the polymers are yet to be addressed. Introduction of bioreactor system in tissue engineering addressed many challenges in this field. Bioreactor system provides the balanced microenvironment with optimal physical and chemical parameters resulting in improved proliferation, differentiation and production of functional tissue. Various types of bioreactors were developed and evaluated for the purpose of developing engineered tissue grafts. Significant differences noticed in the tissues developed and the problems aroused during the tissue development, lead to the invention of perfusion flow bioreactor system. Mechanical loading on the cells in perfusion reactor system at ex vivo level showed higher proliferation and differentiation of Mesenchymal Stem Cells (MSCs) that is quantified by ALP assay, cell morphological studies, mRNA expression of bone morphogenic protein (BMP) and DNA quantification. The perfusion system is capable of producing multiple tissue engineered constructs with the uniform cell distribution. Compared to other bioreactors it is easy to handle and is being effectively operated in the development of functional tissue for clinical use to meet the global demand.

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MicroRNA-200a modulates the metastasis of side population cells in human hepatocellular carcinoma via the transactivation of ZEB2 expression

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Recently, microRNAs (miRNAs) have been linked to cancer metastasis. Although microRNA-200a (miR-200a) is frequently down-regulated in human cancer, the role of miR-200a in side population (SP), cancer stem cells (CSCs) has not been investigated. In this study, 101 pairs of primary hepatocellular carcinoma (HCC) tissues and matched normal control tissues were analyzed for miR-200a expression and its clinicopathological value was determined. The SP cells of HCC cell lines were subjected to an *in vitro/vivo* metastatic analysis. The expression of possible downstream targets of miR-200a in SP cells including that of the zinc finger E-box-binding homeobox (ZEB) protein was validated. Here, we found that miR-200a was down-regulated in HCC/SP and was related to metastasis. MiR-200a suppressed the metastasis of SP cells *in vitro/vivo*. The overexpression of miR-200a in SP cells reduced the expression of metastasis related markers and reduced the expression of ZEB2. The associations between miR-200a, SP cells and ZEB2 were validated in HCC. Collectively, these findings reveal that miR-200a may exert effects on the metastasis of SP cells via the transactivation of oncogene ZEB2.

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