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The effects of osmolarity on mesenchymal stem cells chondrogenesis

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Articular cartilage is a unique tissue able to provide a low-friction, wear-resistant, load-bearing surface in joints for decades. However, this surface is commonly disrupted in an age-associated manner or through acute injury. However, cartilage has a very limited blood supply resulting in inadequate repair post injury. The most common treatments for cartilage repair ACI Autologous Chondrocyte Implant and MACI Matrix Assisted Autologous Chondrocyte transplantation take the advantage of autologous chondrocytes. However, such strategies suffer from donor site morbidity and inadequate cell supply. Alternatively, Mesenchymal Stem Cells (MSC) can be used to overcome such limitations. MSCs, can be induced to differentiate down the chondrogenic pathway under specific conditions. Osmolarity is a major biophysical regulator of chondrocyte function. Due to the presence of fixed, highly negatively-charged polysulphated proteoglycans, in comparison to other tissues there is an increase in cation (Na⁺, K⁺ and H⁺) concentration in articular cartilage, leading to cartilage having raised osmolality. The aim of this study was to investigate the effects of osmolarity on adipose derived MSC chondrogenesis. To fulfill that, MSCs were cultured under different hyper-osmotic conditions, using either NaCl as an ionic osmolyte, or sorbitol as a non ionic osmolyte and also an osmoprotectant or Poly Ethylene Glycol (PEG) as an organic osmolyte to raise the medium osmolarity. The effect of hyper-osmolarity on MSC growth and proliferation was evaluated by MTT assay. Changes in gene expression levels for cartilage specific markers Collagen II, Aggrecan, Versican, Sox9 and also for Matrix Metallo-Proteinase (MMP) were appraised by real time PCR. Also, chondrogenesis was assessed by measuring secreted glycosamin glycan in the medium or that kept in cell ECM. The results will be determined by the appropriate osmolarity and ideal sort of osmolyte for chondrogenesis.

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Big data & analytics in healthcare industry

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With the advent of technology in information management field it is becoming increasingly important to make intelligent use of data, that too in real time, for decision making to seek insights in to data. Exponential pace of technology adoption across all lines of business is opening up new frontiers in healthcare sector. Big data comprising of the four “V”s namely Volume, Velocity, Variety & Veracity of data, now can be analyzed in real time to help decision support systems and we are not at the cusp of new human machine interaction with cognitive computing becoming a reality. Healthcare industry is one of the biggest contributors to big data, which renders itself to new business opportunities related to personalized medicine, telemedicine and personalized insurance. Integrating and analyzing the volume & variety of data from disparate sources is fueling growth in healthcare sector with the adoption of Industry standards which help integrate disparate businesses together. Today, we are also talking about data-in-motion, which is real time data, in addition to the data-at-rest which is historical data of clinical trials, genome research and hospital information data, all coming together to provide new insights in to data, to help arrive at robust and accurate decision making. In this paper, we will discuss the technology trends related to big data and analytics and its adoption in healthcare industry, which will change the face of healthcare industry for 21st century

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