Chondrogenesis of rhesus macaque SCNT-ES and iPS cells in bioresponsive hydrogels

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Abstract

Dr. Johnstone's laboratory has recently developed novel bioresponsive hydrogel scaffolds that can be tuned to suit the cell types encapsulated in them. These scaffolds are degraded by the differentiating cells as they produce their own extracellular matrix. The work so far has involved postnatal human cells, both chondrocytes and mesenchymal stem cells (MSC). For this pilot study, we are proposing to create a bioresponsive scaffold for somatic cell nuclear transfer-derived embryonic stem cells (SCNT-ES cells) and induced pluripotent stem cells (iPS cells) from the rhesus macaque. These cell types have been developed by Dr. Mitalipov's laboratory. For translation to *in vivo* implantation, these bioresponsive scaffolds will need to contain stimuli for the cells to differentiate. *Our hypothesis is that engineering chondrogenic signals into the bioresponsive scaffolds we have developed will stimulate differentiation of rhesus embryonic stem cells and facilitate the production of a regenerative cartilaginous tissue.* The specific aims of the pilot project are to (i) tether RGDS cell adhesion peptides and (ii) TGF-1 into hydrogels with differentially degradable tethers to stimulate macaque SCNT-ES and iPS cell chondrogenesis in the bioresponsive scaffolds. The result should be biomimetic, bioactive, bioresponsive stem cell implants for articular cartilage regeneration.