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In Vitro and *In Vivo* Non-viral SRY (Sex Determining Region Y)-Box 9 (SOX9) and Telomerase Reverse Transcriptase (TERT) Genes Transfer in Chondrocytes: *Work in Progress*

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ABSTRACT

Objectives/Research Problem: Degenerative joint disease normally affects older population which eventually disturb patient's mobility. Current available prescriptions and surgical procedures are incapable to cure the disease completely due to the nature of avascular cartilage. Gene transfer and tissue engineering have emerged as promising approaches in treating the disease. The idea behind the incorporation of the two approaches is to regenerate a stable tissue engineered cartilage constructs by enhancing the cells source. Hence, the aim of this study is to assess the effect of non-viral SOX9 and TERT genes transfected chondrocytes *in vitro* and *in vivo*.

Materials and Method: With the approval of Institutional Animal Care and Use Committee (IACUC-IIUM) (IIUM/IACUC/Approval 2015/(5)/(24)), SOX9 and TERT genes are transferred in monolayer cultured chondrocytes via lipofection technique. The post-transfected chondrocytes are then seeded in a three-dimensional (3D) poly(lactic-co-glycolic) (PLGA) with and without fibrin scaffolds for tissue engineered cartilage constructs formation in vitro. The resulting constructs are implanted subcutaneously in the athymic nude mice for constructs' maturation purpose. The incorporation of cells in the 3D scaffold in vitro and the in vivo implantation are important to mimic the internal microenvironment of the human body. The monolayer post-transfected chondrocytes, in vitro and in vivo 3D constructs are evaluated with several different assessments namely glycosaminoglycan (GAG) assay, cell proliferation assay, histological and immunohistochemistry, gene expression assessment. This is done to confirm the chondrogenic properties of the constructs based on selected time points.

Results and Discussion: Several preliminary findings are obtained. The results show certain trend towards synergistic effect of both SOX9 and TERT genes on chondrocytes. However, no conclusion can be made at this juncture. The experiment is still ongoing.

Conclusion: It is hoped that the combination of SOX9 and TERT genes can help regenerate a good quality cartilage for tissue engineering purpose.

KEYWORDS: Gene Transfer, SOX9, TERT, Cartilage, Tissue Engineering

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