

Expansion of Adult Human Chondrocytes on an Extendable Surface: A Strategy to Reduce Passageing-Related Dedifferentiation

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INTRODUCTION:

Cell-based cartilage tissue engineering approaches generally require chondrocytes from a small biopsy to be expanded in monolayer culture. However, prolonged culture and passaging is associated with dedifferentiation and subsequently reduced capability to produce functional cartilage tissue [1].

Instead of letting cells to grow confluent before plating them into a bigger culture dish, continuously providing cells more space as they grow reduces the need for passaging. By using a novel system with an extendable growth surface to culture chondrocytes, we would like to test the hypothesis that lower **passaging number would better maintain the chondrocytic phenotypes and enhance their post-expansion chondrogenic capacity.**

Before we can address this main question, appropriate conditions for expanding chondrocytes on extendable surfaces must be found.

METHODS:

Adult human articular chondrocytes (AHAC) of one donor were seeded on an extendable, Collagen I (Coll I) functionalized poly dimethyl siloxane (PDMS) membrane [2]. AHAC were allowed to attach for 24 h before the membrane surface area was isotropically extended at a rate of 4% every 4h using a Cellerator (Cytomec GmbH). This device consists of a motorized iris-like mechanism which holds the PDMS membrane. Membrane expansion is thereby automated [3].

Control static conditions were Coll I coated PDMS membranes, uncoated and Coll I coated tissue culture treated plastic dishes (TCPS).

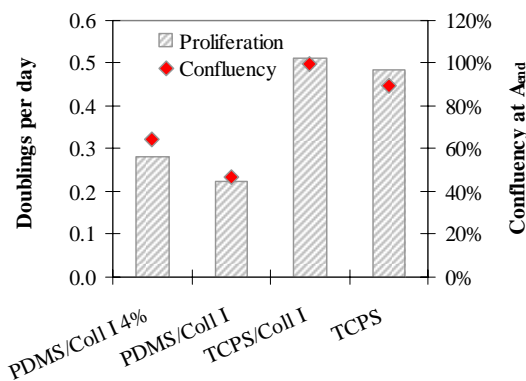


Fig. 1 Cell Proliferation and Confluency

RESULTS:

On the extendable Coll I functionalized PDMS surface, AHAC attachment was as quantitative as on TCPS surfaces. However, on the functionalized PDMS membranes, AHAC proliferation rate was reduced nearly of two fold. Importantly, AHAC cultured on functionalized PDMS membrane under surface extension proliferated with 1.3-fold higher rate than those statically cultured on Coll I coated PDMS membrane (**Fig. 1**).

DISCUSSION & CONCLUSIONS:

These preliminary results show that it is feasible to expand AHAC on an extendable surface (total area increase: 300%). Ongoing experiments are aimed at investigating if such culture technique by enabling to reduced/avoid cell passaging, could better maintain the chondrocytic phenotype and enhance the chondrogenic capacity of AHAC as compared to standard monolayer culture conditions.

REFERENCES:

- [1] E. M. Darling & K. A. Athanasiou, *J Orth. Res.*, 23 (2005) 425-432. [2] Communication by B. Hinz, EPFL. [3] <http://www.cytomec.com>