

CHONDROGENIC POTENTIAL OF CHONDROCYTES IN HYALURONIC ACID/PEG-BASED HYDROGELS IS DEPENDENT ON THE HYALURONIC ACID CONCENTRATION

V. H. M. Mouser, Utrecht University, The Netherlands
R. Levato, Utrecht University, The Netherlands
A. Abbadessa, Utrecht University, The Netherlands
W.M.G. Groen, Utrecht University, The Netherlands
W.E. Hennink, Utrecht University, The Netherlands
T. Vermonden, Utrecht University, The Netherlands
D. Gawlitta, Utrecht University, The Netherlands
J. Malda, Utrecht University, The Netherlands

Purpose:

Hydrogels based on PEG and methacrylated poly(*N*-(2-hydroxypropyl) methacrylamide-mono/dilactate) (M₁₀P₁₀) are promising biomaterials for Biofabrication of cartilage constructs. Addition of hyaluronic acid (HA) to a hydrogel improves printability by increasing the viscosity. Methacrylating HA (HAMA) can ensure covalent binding in M₁₀P₁₀ hydrogels after UV-cross-linking. Chondrocytes can interact with HAMA via their CD44 receptor, however, the influence of HAMA on chondrogenic potential is unclear. This study aimed to evaluate the influence of different HAMA concentrations on chondrogenesis of chondrocytes in M₁₀P₁₀/HAMA hydrogels.

Materials & Methods:

Equine chondrocytes were encapsulated in M₁₀P₁₀ hydrogels containing different HAMA concentrations. Cylindrical constructs were cast, UV-cross-linked, and cultured in TGF- β -containing medium. Constructs were analyzed for evidence of cartilage formation.

Results:

Preliminary data showed an increase in glycosaminoglycan (GAG)/DNA for constructs with low HAMA concentrations (0.1-0.25%) while no differences were found for higher HAMA concentrations, compared to hydrogels without HAMA (Figure 1a). Further, constructs without or with low HAMA concentrations (0.1-0.5%) demonstrated collagen type II positive areas, while this was less pronounced in constructs with 0.5-1% HAMA (n=3, Figure 1b).

Conclusion:

Preliminary results indicate a dose-dependent effect of HAMA on chondrogenesis of chondrocytes: low concentrations (0.1-0.25%) increase GAG production while higher concentrations (0.5-1%) have no effect on GAG production and reduce collagen type II synthesis. Ongoing evaluations will reveal the extent of chondrogenesis and its association with HAMA concentrations in M₁₀P₁₀/HAMA, and the mechanism responsible for the dose-dependent effect. This study will impact the use of HAMA as viscosity enhancer to improve the printability of hydrogels.