

23.4 The combination of dynamic compression and shear with rvBMP-2 for in-vitro cartilage tissue engineering [Abstract]

G. M. Salzmann, P. Schmitz, M. Anton, M. Stoddart, S. Grad, S. Milz, T. Tischer, Stephan Vogt, B. Gansbacher, A. B. Imhoff, M. Alini

Angaben zur Veröffentlichung / Publication details:

Salzmann, G. M., P. Schmitz, M. Anton, M. Stoddart, S. Grad, S. Milz, T. Tischer, et al. 2007. "23.4 The combination of dynamic compression and shear with rvBMP-2 for in-vitro cartilage tissue engineering [Abstract]." *Osteoarthritis and Cartilage* 15 (Supplement B): B81. [https://doi.org/10.1016/s1063-4584\(07\)61332-6](https://doi.org/10.1016/s1063-4584(07)61332-6).

23.4

The combination of dynamic compression and shear with rvBMP-2 for in-vitro cartilage tissue engineering

G.M. Salzmann¹, P. Schmitz¹, M. Anton², M. Stoddart³, S. Grad³, S. Milz⁴, T. Tischer¹, S. Vogt¹, B. Gansbacher², A.B. Imhoff¹, M. Alini³; ¹Department Of Orthopaedic Sports Medicine, Klinikum rechts der Isar, Technical University of Munich, Muenchen, Germany, ²Department Of Experimental Oncology, Klinikum rechts der Isar, Technical University of Munich, Muenchen, Germany, ³Biomaterials And Tissue Engineering Unit, AO Research Institute, Davos, Switzerland, ⁴Bio-performance Of Materials & Devices Program, AO Research Institute, Davos, Switzerland

Purpose: Both bioreactor conditions and gene therapy have shown to enhance chondrogenesis. The purpose of this study was to compare the effects of dynamic compression and shear, alone or in combination with retrovirally expressed bone morphogenetic protein 2 (BMP-2), on chondrocytes in vitro.

Methods and Materials: Primary bovine chondrocytes were either retrovirally transduced with BMP-2 or left untreated. Cells were seeded in 3-D polyurethane scaffolds (n=48) and further cultured under static conditions or exposed to defined dynamic compression and shear in a joint specific bioreactor. One week after seeding four groups were investigated: G1-uninfected, G2-BMP2-infected, G3-uninfected + load and G4-BMP2-infected + load, each at three time points (d7, d21, d35). Outcome measurements included wet weight, DNA-content, glycosaminoglycan (GAG) medium release/scaffold content, collagen 1, 2, aggrecan, Sox 9 mRNA, histology and ELISA for BMP-2-transgene expression. Values given are normalized to G1 at d35.

Results: Wet weight/DNA-content were highest in G4/G2, while DNA-content declined over time. GAG release/scaffold content and GAG per DNA increased over time and was highest in G4/G3 (p<0,05). Collagen 1 was lowest in G1/G4, collagen 2 was highest in G4/G2 (p<0,05), aggrecan was highest in G3/G4 (p<0,05), while Sox9 was highest in G4/G3 (p>0,05). Only collagen 2/aggrecan showed significant increases in all groups over time. Cumulation was highest in G4. Histology revealed highest cell density in G4/G2. BMP-2-transgene expression was stable through d35.

Conclusions: When compared to control, in-vitro chondrogenesis is most efficient when simultaneous stimulation with dynamic compression and shear, combined with BMP-2, is applied.