

The mimic effects of knee exercise by mechanobiology technology induce chondrogenesis in MSC

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Mesenchymal stem cells (MSCs) are currently being investigated as a cell source for regenerative medicine approaches for the repair of damaged articular cartilage. It is important to understand how these cells react to the complex loading environment of a joint *in vivo*, to use them as a source for the cell-based therapy for articular cartilage regeneration. In addition to investigate alternative MSC sources, it is also important to study the structure of tissue-engineered constructs and their organization within them. A custom-built bioreactor was used to expose human MSCs to a combination of shear and compression loading. The MSCs were either evenly distributed throughout fibrin-poly(ester-urethane) scaffolds or asymmetrically seeded with a small proportion seeded on the surface of the scaffold. The effect of cell distribution on the production and deposition of cartilage-like matrix in response to mechanical load mimicking *in vivo* joint loading was then investigated. The results showed that asymmetrical seeding the scaffold led to markedly improved tissue development based on histologically detectable matrix deposition [1]. Consideration of cell location, therefore, is an important aspect in the development of regenerative medicine approaches for cartilage repair. This is particularly relevant when considering the natural biomechanical environment of the joint *in vivo* and patient rehabilitation and adapted physical activity protocols.

This study was supported by the University Research Project Grant (Triennial Research Plan 2016-2018), University of Catania, Italy.

References

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Key words

MSC, articular cartilage, bioreactor, chondrogenesis, mechanobiology.