

3D collagen type I-based cell free scaffold for joint cartilage regenerative strategy.

Marta Anna Szychlinska¹, Giovanna Calabrese², Michelino Di Rosa¹ and Paola Castrogiovanni¹.

¹ Department of Biomedical and Biotechnological Sciences, Human Anatomy, Histology and Movement Sciences Section, School of Medicine, University of Catania, 95123 Catania, Italy

² Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, Physiology Section, University of Messina, 98122 Messina, Italy

The articular cartilage defects represent a big challenge due to the limited self-healing capacity of this complex tissue. Several approaches in this field obtained partial suitable results. Engineered cartilage, which combines innovative biomaterials and mesenchymal stem cells, emerges as a promising strategy for the cartilage regeneration. The aim of this study was to investigate the collagen I-based cell-free scaffold ability to promote cartilage repair after its *in vivo* orthotopic implantation. The cartilage defects were created at the patellofemoral groove in rat knees, the cell-free scaffolds were implanted into articular defect and maintained for 4, 8 and 16 weeks. No scaffold was implanted for the experimental control group. At each time-point post-transplantation, general features of cartilage repair process are evaluated through morphological, histochemical and gene expression analyses. At 4 weeks, histological analysis shows the formation of fibrous tissue, replaced progressively by a tissue resembling the calcified one at 16 weeks in the experimental control group. In the experimental group receiving cell-free scaffold, progressive replacement of the collagen scaffold with the newly formed cartilage-like tissue is observed, as confirmed by Alcian Blue staining and immunohistochemical and gene expression analyses, which show the expression of typical cartilage markers. The results of this study suggest that the collagen I-based cell-free scaffold is able to recruit host cells from the surrounding joint tissues and to promote cartilaginous repair of articular cartilage defects, suggesting its use as a potential strategy for articular cartilage regenerative approaches.

References

[1] Calabrese G, et al. *Front Physiol.* 2017;8:984. doi:10.3389/fphys.2017.00984.

[2] Szychlinska MA, et al. *Exp Cell Res.* 2017;357(2):222-235. doi:10.1016/j.yexcr.2017.05.018.

X

Key words: articular cartilage defect; cartilage regeneration; cartilage tissue engineering; collagen I-based cell-free scaffold; orthotopic implantation