



## A novel role in skeletal segment regeneration of extracellular vesicles released from periodontal-ligament stem cells

### ABSTRACT

The combination of biomaterials and stem cells represents a common strategy for bone-tissue-engineering applications and collagen membranes show ideal biological properties, supporting infiltration and proliferation of osteoblasts and promoting bone regeneration. In this interesting study, the Authors aimed to develop a new biocompatible osteogenic construct composed of a commercially available collagen membrane (OsteoBiol® Evolution, Tecnos®, Giaveno, Italy), human periodontal-ligament stem cells (hPDLSCs) enriched with extracellular vesicles (EVs), or polyethylenimine (PEI)-engineered EVs (PEI-EVs). Evolution membrane was chosen because is a high-consistency dense collagen fiber derived from equine mesenchymal tissue featuring a maximum adaptability to hard and soft tissue, easy and secure suturability of nearby tissue, great stability, and sufficient protection of underlying grafts. Moreover, OsteoBiol® Evolution can be used as a drug carrier. OsteoBiol® Evolution enriched with hPDLSCs and EVs/PEI-EVs was investigated in rats subjected to calvarial defects and showed high biocompatibility and osteogenic properties in vitro and in vivo. In addition, quantitative reverse-transcription polymerase chain reaction demonstrated the up-regulation of osteogenic genes, such as TGFB1, MMP8, TUFT1, TFIP11, BMP2, and BMP4, in the presence of PEI-EVs.

### CONCLUSIONS

Based on the encouraging findings of this study, the Authors conclude suggesting that *“Evo enriched with hPDLSCs and PEI-EVs is capable of inducing bone regeneration. In particular, PEI-EVs played a key role in the activation of the osteogenic regenerative process. Indeed, the presence of PEI-EVs improved the mineralization process and induced an extensive vascular network, suggesting an osseointegration process”*.

### LABORATORY TESTS

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