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Osteogenic potential of human dental pulp stem cells co-cultured with equine bone substitute combined with melatonin

LABORATORY TESTS

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ABSTRACT

It has been demonstrated that melatonin, naturally produced by the pineal gland, has several specific functions in the oral cavity as it targets the overall remodelling process through its dual actions on osteoblasts and osteoclasts. It enhances the genic expression of bone markers and the expression of osteogenic factors. As melatonin facilitates new bone growth and osteointegration, it can be considered as an interesting molecule for use in bone implants when used alone or in combination with other growth factors, in particular RUNX2.

In order to evaluate the possible synergic effect of bone grafts and melatonin on human DPSC (hDPSC) proliferation and differentiation in an osteogenic pattern, the Authors selected cancellous blocks of equine origin (OsteoBiol® *Sp-Block*, Tecnoss®, Giaveno, Italy), produced without ceramization of the hydroxyapatite crystals. hDPSCs were cultured in vitro, both in growth medium (GM) and differentiation medium (DM) for 7, 14, and 21 days in four experimental conditions: DPSCs (control), DP- SCs co-cultured with equine bone blocks, DPSCs cultured with 100-µm melatonin (Sigma-Aldrich), and DP- SCs co-cultured with equine bone blocks and 100-µm melatonin. Cells were plated on one Petri dish per group, per medium, per time point. At the end of each time point, the cells were detached, harvested, and used for the analysis of miRNA expression, gene expression, and osteocalcin levels.

From the analysis performed, it was evident that equine bone block enhanced DPSCs differentiation. Moreover, the simultaneous presence of equine bone block + melatonin further enhanced DPSC differentiation.

CONCLUSIONS

As the construct composed by DPSCs/equine bone block + melatonin seemed to be an effective, biocompatible system, useful for bone tissue engineering, the Authors concluded that *"the encouraging findings of this in vitro study suggested a positive role of melatonin in bone tissue engineering. The conducted study is highly promising from a translational point of view, as it can represent a fundamental starting point for a future clinical approach and applied research"*.

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Material tested

BONE SUBSTITUTE
OsteoBiol® *Sp-Block*

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