

Human Periodontal Ligament Stem Cells and their Engineered Vesicles: A New Approach in 3D Printed Bone Tissue Regeneration

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In the bone regeneration field, properties of 3D scaffold could be improved using cellular and their released products. The aim of the study was to investigate the properties of 3D printed PLA scaffolds (PLA) for bone regeneration obtained through 3D printing, evaluating the differences in terms of structural properties, *in vitro* and *in vivo* cellular responses induced by different scaffold structures. Five porous scaffold designs were fabricated from a poly-(lactide) (PLA) filament. Scaffold structural parameters were measured using scanning electron microscopy, and micro-computed tomography. Nano-topographic surface features were investigated by means of atomic force microscopy. After 112-day period, PLA were degraded and changes in weight, pH and mechanical properties. Influence of degradation on cellular activity was evaluated by means MTT assay on human periodontal ligament stem cells (hPDLSCs) in presence of degradation byproducts. Osteogenic differentiation of hPDLSCs on different scaffold designs after 21 days of culture was measured by means RT-PCR and Western Blot. After *in vitro* evaluation the *in vivo* performance were tested. *In vivo* study was performed using C57BL/6 mice and was designed in 5 different groups:

- Group1: PLA loaded with hPDLSCs;
- Group2: PLA loaded with Conditioned Medium (CM) derived from hPDLSCs;
- Group3: PLA loaded with Extracellular Vesicles(EVs) purified fromCM;
- Group4: PLA loaded with EVs covered with PolyEthylenImine (PEI);
- Group5: PLA, used as control.

Histological analysis were performed after 60 days of *in vivo* implantation and morphological evaluations revealed a high bone tissue formation and osteogenic cells commitment in group 3 and 4 when compared to other groups.

Biography:

Dr. Francesca Diomede is a Research Fellow at the Department of Medical, Oral and Biotechnological Sciences, Chieti University (Italy). She received her Ph.D. in Basic and Applied Medical Sciences at University of Chieti, where she completed the postdoctoral training in stem cell biology.