

# INTERNATIONAL CONFERENCE ON CELL SCIENCE AND REGENERATIVE MEDICINE



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## **Fabrication of a PLLA/HA/dECM composite scaffold for encouraging osteogenesis of stem cells**

**Abstract:** In osteogenic differentiation of human stem cells, they can be affected by the biochemical microenvironments as well as the mechanical microenvironments of the biomaterials. In particular, based on this perspective, the incorporation of bioactive organic and inorganic components can significantly influence the differentiation of stem cells into the osteogenic lineage. Poly (L-lactic acid) (PLLA)-based biocomposites have been widely used in hard tissue engineering applications due to their reasonable biocompatibility and mechanical properties. However, the imperfect bioactivity and mechanical properties of these composites limit their use in bone defect regions that require high load-bearing capacity. To address this issue, this study introduced two fabrication strategies to enhance the mechanical and biological properties of hydroxyapatite (HA)/PLLA biocomposites. By incorporating in situ plasma treatment during the 3D printing process, followed by thermal annealing, the flexural modulus of the composite increased by 2.1-fold compared to standard HA/PLLA composites. Additionally, this combinational process enabled the efficient coating of bioactive material, which is decellularized extracellular matrix (dECM) derived from porcine bones. The fabricated biocomposite scaffold was evaluated for various in vitro cellular activities, including cell proliferation and osteogenic activity. Based on the mechanical and biological studies, the cultivation of human stem cells with the HA/PLLA/dECM biocomposite scaffold can be a promising candidate for bone tissue regeneration.

**Keywords:** Tissue Engineering, Stem cell osteogenesis, 3D printing, Biocomposites, In situ plasma treatment, dECM coating