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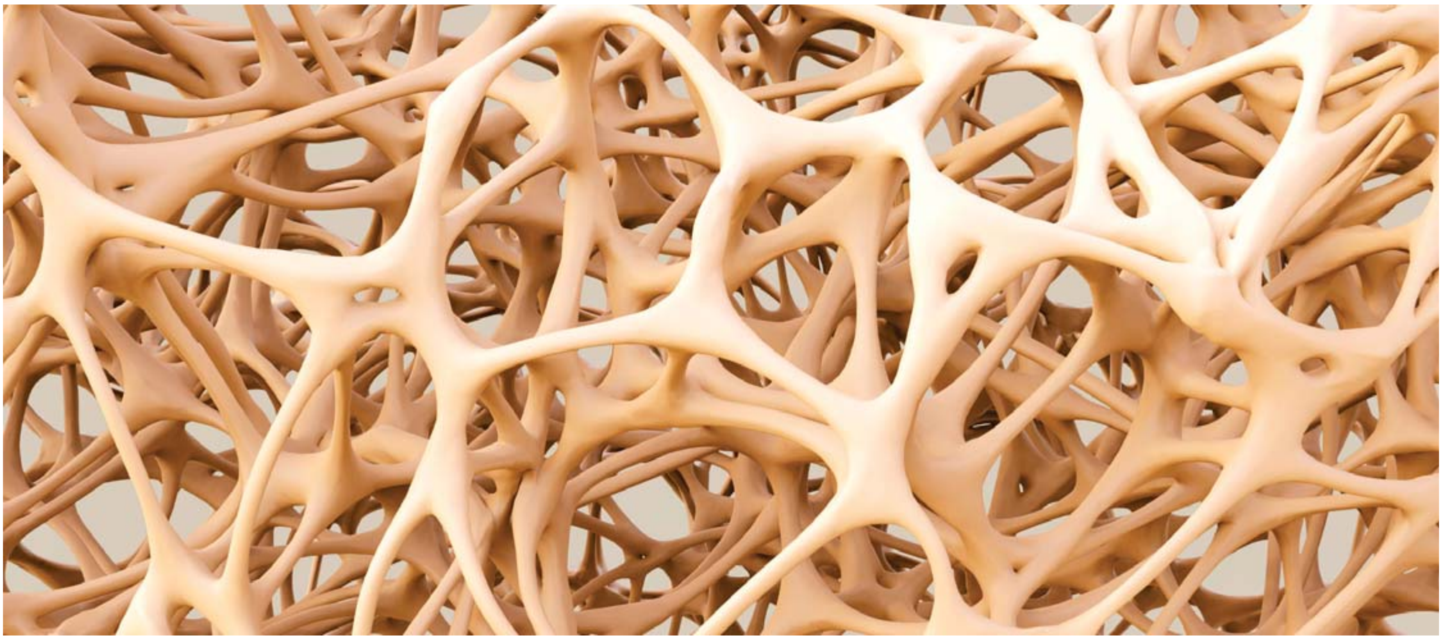

Research Highlight

ROLE OF POLYCAPROLACTONE-TRIFUMARATE IN BONE TISSUE ENGINEERING

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Key words:
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fibrillar collagen
mineralization
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Osteoprogenitor cells are the stem cells that exist in bone and generate osteoblasts. They are derived from ancient mesenchymal cells. Accordingly, establishing a new biocompatible material is mandatory that at as a substrate for growth, proliferation as well as differentiation of osteoprogenitor cells. It is reported that PCL is an FDA-approved biodegradable polymer that is employed as resorbable sutures. It has also been investigated as a scaffold for skin[1], heart muscle[2] as well as bone[3] tissue engineering.

Polycaprolactone fumarate (PCLF) is a cross-linkable derivative of polycaprolactone which is apt for tissue engineering applications[4,5]. PCLF has shown significant results in the repair of segmental nerve defects as well as a bone substitute.

Scientists have reported the manufacture and biocompatibility of linear polycaprolactone fumarate (PCLF). Moreover, it can also be utilized in nerve tube regeneration that is astonishing.

The synthesis of PCLF includes the condensation polymerization of fumaryl chloride with polycaprolactone diol of molecular weights 530, 1200, or 2000 g mol^{-1}. PCLF polymer is responsible for the thermal, mechanical and rheological properties[6].

In addition, this substance also has the potential to be employed as injectable material for treatment of skeletal defect when the material in semi-crystalline form is brought near to melting temperature[6].

This situation motivated scientists for conducting new research in order to assess the effectiveness of poly(caprolactone-trifumarate) (PCLTF) as scaffold for *in vitro* Bone Marrow Stromal (BMS)-derived osteoblasts growth, proliferation as well as differentiation by using scanning electron microscopy[7].

Polycaprolactone-trifumarate (PCLTF) is a PCL based polymeric macromere that contains three fumarate groups. PCLTF manufactured into viscous liquid form, with a surplus of unreacted hydroxyl groups (-OH) that exist within the PCL-backbone. Accordingly, it is thought that hydroxyl groups can improve the hydrophilicity of the newly manufactured polymeric macromere, which then can assist cell attachment onto the scaffold[7].

In this experiment, Scanning Electron Microscopy (SEM) showed osteoblasts adhesion and proliferation on the PCLTF scaffold after three days of culture. However, on the 14th day, scientists found fibrillar collagen network and calcified globuli as they were deposited on the PCLTF scaffold and at

28 days huge mineralization on PCLTF was observed as well. ALP secretion was noticed in both cells seeded PCLTF scaffold and positive controls and their total ALP fold production was not different, considerably.

Moreover, Von-Kossa staining determined calcium mineral pigments present on cells seeded PCLTF scaffold. Bone-like tissue structures were found on H & E stained slides of cells seeded PCLTF scaffold after twenty days of incubation. BMS-derived osteoblasts growth, proliferation, and differentiation were observed on synthesized PCLTF porous scaffold. Conclusively, scientists stated that PCLTF can be efficiently employed as a scaffold for bone tissue engineering.

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