

# Evaluation Of The Effect Of Poly ( $\epsilon$ -Caprolactone)/Poly (L-Lactic) Acid/Gelatin Nanofiber 3d Scaffold Containing Resveratrol On Bone Regeneration

Kargar Jahromi Hossein, Alizadeh Morteza, Ehterami Arian, Vaez Ahmad, Cheraghali Danial, Chegini Leila, Rezaei Kolarijani Nariman, Salehi Majid

## Abstract

Bone defects affect many people and impose expenses of costly treatment with possible complications. This study aims to investigate a novel Poly ([Formula: see text]-caprolactone)/Poly (L-lactic) acid/Gelatin nanofiber [PCL/PLA/GNF] scaffold containing 5% resveratrol (Resv) which was manufactured via thermally induced phase separation technique (TIPS), and its applicability for bone defect treatment. Gelatin nanofiber (GNF) was synthesized via the electrospinning method and mixed with PCL/PLA solution and then 5% resveratrol was added to fabricate a 3D scaffold via the TIPS technique. The prepared scaffolds were evaluated regarding their porosity, morphology, contact angle, degradation properties, biomechanical, blood compatibility, and cell viability via MTT assay. The scaffolds were further investigated by implantation in a rat femur defect model. PCL/PLA/GNF with 5% Resv showed a cancellated structure with irregular-shaped pores. The mean pore size was estimated to be 160 [Formula: see text] $\mu$ m and the porosity was  $80.56 \pm 2.68\%$ . The contact angle of the fabricated scaffold was  $95.4 \pm 3.4$ , which determines the hydrophobic nature of the scaffold. Increased cell viability in scaffolds was observed by adding resveratrol. Twelve weeks after the implantation of the scaffold into the bone defect, the defects filled with PCL/PLA/GNF-resveratrol contained scaffold were remarkably better than PCL/PLA/GNF and negative control group ( $89.23 \pm 6.34\%$  in 12 weeks), and the difference was significant ( $p < 0.05$ ). In conclusion, the PCL/PLA/GNF scaffold containing 5% of resveratrol demonstrated adequate mechanical and physical properties. There is possible applicability of PCL/PLA/GNF scaffold containing 5% of resveratrol for surgical treatment of bone defects.

**Keywords:** PCL/PLA/GNF scaffold, resveratrol (Resv), thermally induced phase separation technique (TIPS), bone tissue engineering