



Repairing rabbit radial defects by combining bone marrow stroma stem cells with bone scaffold material comprising a core-cladding structure

H. Wu^{1,2}, G.H. Liu², Q. Wu¹ and B. Yu¹

¹Southern Medical University, Guangzhou, China

²Second Affiliated Hospital of Inner Mongolia Medical University, Hohhot, China

Corresponding author: B. Yu

E-mail: yubinsmu@163.com

Genet. Mol. Res. 14 (4): 11933-11943 (2015)

Received January 8, 2015

Accepted May 18, 2015

Published October 5, 2015

DOI <http://dx.doi.org/10.4238/2015.October.5.7>

ABSTRACT. We prepared a bone scaffold material comprising a PLGA/ β -TCP core and a Type I collagen cladding, and recombined it with bone marrow stroma stem cells (BMSCs) to evaluate its potential for use in bone tissue engineering by *in vivo* and *in vitro* experiments. PLGA/ β -TCP without a cladding was used for comparison. The adherence rate of the BMSCs to the scaffold was determined by cell counting. Cell proliferation rate was determined by the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide method. The osteogenic capability was evaluated by alkaline phosphatase activity. The scaffold materials were recombined with the BMSCs and implanted into a large segmental rabbit radial defect model to evaluate defect repair. Osteogenesis was assessed in the scaffold materials by histological and double immunofluorescence labeling, etc. The adherence number, proliferation number, and alkaline phosphatase expression of the cells on the bone scaffold material with core-cladding structure were significantly higher than the corresponding values in the PLGA/ β -TCP composite scaffold material ($P < 0.05$). An

in vivo test indicated that the bone scaffold material with core-cladding structure completely degraded at the bone defect site and bone formation was completed. The rabbit large segmental radial defect was successfully repaired. The degradation and osteogenesis rates matched well. The bone scaffold with core-cladding structure exhibited better osteogenic activity and capacity to repair a large segmental bone defect compared to the PLGA/ β -TCP composite scaffold. The bone scaffold with core-cladding structure has excellent physical properties and biocompatibility. It is an ideal scaffold material for bone tissue engineering.

Key words: Core-cladding structure; Osteogenic capability; Bone defect; Bone tissue engineering