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Osteoinductive effects in hMSC by novel synthetic peptide (OP-5) derived from BMP-2 and its application with OP-5 conjugated PLLA for clinical use

Bosun Kwon[1, 3], **Hyeeun Shim**[1], **Sehee Kim**[1], **Jinkyu Lee**[2], **Yoonjung Hong**[3], **Hyunah Jung**[3], **Jiyeon Moon**[3] and **Heungsoo Shin**[2]
[1]Wooridul HueBrain Ltd, South Korea
[2]Hanyang University, South Korea
[3]Winnova Ltd, South Korea

Bone morphogenetic protein-2 (BMP-2) was well known as a growth factor to promote the bone formation and regeneration. Even if widely used in orthopedics and dental implant surgery, it appears a variety of side effects including unwanted bone formation, cancerous signaling process and so on. To solve these problems, novel synthetic peptide (osteogenic peptide-5, OP-5) derived from BMP-2 was employed and even coated onto from poly (L-lactide) (PLLA) fibers for the clinical use. First, its influence on osteogenic differentiation of hMSC was evaluated *in vitro* and *in vivo* assay and compared with BMP-2. In *in vitro* assay, OP-5 increased the expression of osteogenic markers, such as ALP, ARS and up regulated osteogenesis related gene expression in mRNA (RUNX2, BMP-2, osteocalcin) and protein level (β-catenin, CREB, SMAD). To confirm these results, rat calvarial defects model was processed and showed that the bone density and volume was enhanced by OP-5 compared with the control group (scaffold group). To optimize the osteogenic effects of OP-5, it was conjugated onto electrospun fibers fabricted from poly(L-lactide) (PLLA) to do set stable. Small amount of peptide tightly attached to nanofibers could accelerate the bone regeneration. While OP-5 was maintained on the nanofiber at least 28 days, *in vivo* mouse calvarial defect model showed that OP-5 conjugated nanofibers could increase the bone regeneration and mechanical property similar to BMP-2 coated PLLA. Our results suggested that OP-5 can be new therapeutic agents for bone regeneration and OP-5 conjugated nanofibers might be a feasible method for osteoinductive signals as guided bone regeneration for a dental and orthopedic treatment.

Biography

Bosun Kwon has completed his MS and PhD from University of Southern California, USA. He was the Research Advisor and Consultant of Wooridul Spine Hospital, Seoul, Korea. He is the Research Director of Wooridul Huebrain Research Institute and Winnova Integrative Bioresearch Institute, Seoul, Korea. He has various patents and publication related to studies for tissue engineering and has been serving as an Editorial Board Member of The Korea Society of Industrial and Engineering Chemistry.

bskwon9@gmail.com

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