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Evaluation of Differentially Degrable Scaffolds Combined with Adipose Derived Stem Cells and Bone Marrow Derived Stem Cells for Bone Tissue Engineering

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Bone tissue engineering offers a advanced approach that can overcome the limitations by using synthetic biodegradable porous scaffolds loaded with stem cells. In this study, we investigate the osteogenetic potency of the ADSCs and BMSCs, and the properties of synthetic porous scaffolds for idealized tissue engineered bone.

Twenty-four adult Beagles divided in 3 groups; A) scaffolds with ADSCs, B) scaffolds with BMSCs, C) scaffolds with no cells. The experimental group received 4 different scaffolds loaded autologus ADSCs and BMACs in critical size defect model; hydroxyapatite/beta tricalcium Phosphate(6/4;w/w) (OssPol-BMD), Beta Tricalcium Phosphate (OssPol-BHD), Calcium Meta phosphate (CMP), Collagen coated CMP(cCMP), and control group received the acellular scaffolds into the defect sites, respectively. Following sacrifice, bone blocks with the implants were retrieved at 4, 8, 12 weeks after implantation for radiographic, biochemistric, histomorphologic analysis

ALP activities and osteocalcin content of the CMP/BMSCs and CMP/ADSCs composite group were significant higher than other groups at each time points. Histomorphometric measurement presented the percentage of the replacement area occupied by bone were significant higher at the group of CMP group loaded with BMSCs and ADSCs. The mRNA expression of bFGF, ALP, Osteocalcin and GAPDH were stronger in the experimental group loaded MSCs into the scaffolds.

This study suggested adipose tissue may be another source of pluripotent stem cells with multilineage potential and provides ideal methods of osteogenesis in CMP scaffolds with ADSCs for bone tissue engineering.

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