depending on the type of stimulus. Here we hypothesize that LDI induces DSBs mildly, stimulates DNA-PK orderly and activates PKB/Akt signaling pathway ultimately. The final effect above accelerates osteoblasts proliferation and differentiation and further accelerates bone mineralization and union.

Methods: Osteoblasts were randomized into LDI group (cells exposed to irradiation of 25mGy, 50mGy, 75mGy, 100mGy, 150mGy) and SHAM group (cells exposed to 0mGy). At 0 min, 15 min, 24 h after irradiation, γ-H2AX foci analysis was performed to monitor DNA damage. Western-blot was used to detect the activation of DNA-PK and PKB/Akt signaling pathway axis. At 72 h, 96 h, and 120 h later, cell proliferation was measured by MTT. At day 14, colony formation and ALP activities were evaluated.

Results: MTT and colony formation assay results indicated LDI intervention promoted osteoblasts proliferation. The activity of ALP also increased after LDI. Signaling-related proteins, such as DNA- PKcs, Ser473, mTOR, S6K, 4EBP1 etc. displayed higher phosphorylation in LDI group than control.

Conclusion: LDI can promote proliferation and differentiation of osteoblasts by activating AKT (PKB) signaling pathway.

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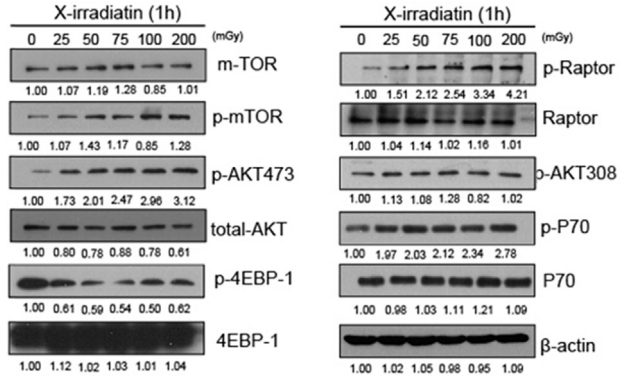

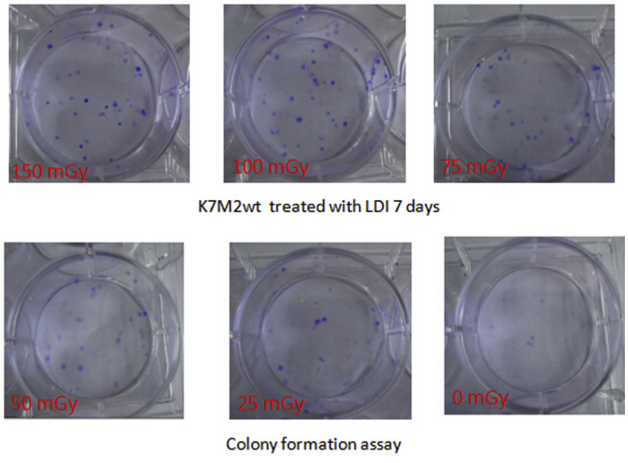

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ONE-STEP SYNTHESIS OF WATER-DISPERSIBLE ULTRA-SMALL Fe_3O_4 NANOPARTICLES AS CONTRAST AGENTS FOR T1 AND T2 MAGNETIC RESONANCE IMAGING

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Uniform, highly water-dispersible and ultra-small Fe3O4 nanoparticles were synthesized via a modified one-step coprecipitation approach. The prepared Fe3O4 nanoparticles not only show good magnetic properties, long-term stability in a biological environment, but also exhibit good biocompatibility in cell viability and hemolysis assay. Due to the ultra-small sized and highly water-dispersibility, they exhibit excellent relaxivity properties. The 1.7 nm sized Fe3O4 nanoparticles reveal a low r2/r1 ratio of 2.03 (r1 = 8.20 mM(-1) s(-1), r2 = 16.67 mM(-1) s(-1)), and the 2.2 nm sized Fe3O4 nanoparticles also appear to have a low r2/r1 ratio of 4.65 (r1 = 6.15 mM(-1) s(-1), r2 = 28.62 mM(-1) s(-1)). This demonstrates that the proposed ultra-small Fe3O4 nanoparticles have great potential as a new type of T1 magnetic resonance imaging contrast agents. Especially, the 2.2 nm sized Fe3O4 nanoparticles have a competitive r1 value and r2 value compared to commercial contrasting agents such as Gd-DTPA (r1 = 4.8 mM(-1) s (-1)), and SHU-555C (r2 = 69 mM(-1) s(-1)). In vitro and in vivo imaging experiments show that the 2.2 nm sized Fe3O4 nanoparticles exhibit great contrast enhancement, long-term circulation, and low toxicity, which enable these ultra-small sized Fe3O4 nanoparticles to be promising as T1 and T2 dual contrast agents in clinical settings.

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THE EFFECT OF LOW DOSE X-RAY RADIATION ON THE BONE INGROWTH ONTO PROSTHESIS INTERFACE

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Introduction: Stimulation of bone formation would be an ideal goal for osseointegration of prosthesis. There are many studies that have proven promotion effects of low dose irradiation (LDI) on osteoblasts. Our preliminary study also showed that LDI could promote fracture mineralization. Based on these findings, we hypothesize that LDI may promote the osseointegration of prosthesis which may be beneficial for preventing the aseptic loosening.

Methods: Fourteen male New Zealand rabbits with an average bodyweight of 2.1±0.2 kg were randomly divided into 0 Gy group and 0.5 Gy group. After anesthetized by an intravenous injection of 3% pentobarbital sodium (2～3ml/kg), a 15mm longitude, 3.5mm diameter titanium alloy stick coated with hydroxyapatite were implanted into the distal part of right femur. Two days later, the 0.5 Gy group animals received 0.5 Gy local x-ray irradiation (Figure. 1). The bone formation marker PINP in the serum was tested by ELISA before the operation and at 2 weeks, 4 weeks, 8 weeks post-operation. Eight weeks post-operation, all animals were sacrificed to isolate femurs for micro-CT and biomechanical analysis.

Results: PINP in all groups were elevated at 2 weeks after operation, and then dropped. In the 0.5 Gy group, PINP level was significantly higher than that in 0 Gy group at week 2 and higher than the baseline level at week 8 post-operation (Figure2). The microCT parameters, BMD, BV, BV/TV, and Tb.N, around the implants in the 0.5 Gy group increased significantly,

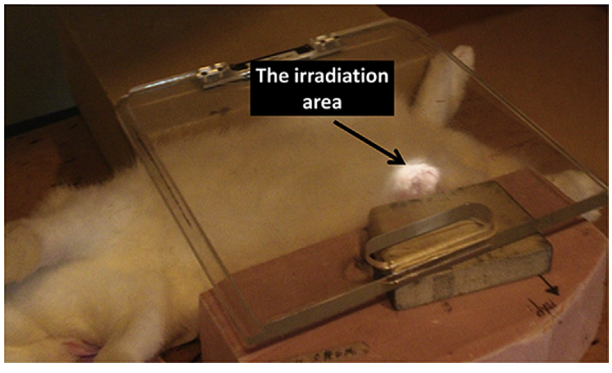

Figure 1