have been found to cause familial hypobetalipoproteinemia, hypercholesterolemia and decreased BMD in humans. Some other candidate genes also show promising effects, however, the exact mechanisms by which PTH stimulate bone formation and the function of FGF receptors in mediating these actions are not fully defined. FGF receptor 3 (FGFR3) has been characterized as an important regulator of bone metabolism and is confirmed to cross-talk with PTH/PTHrP signal in cartilage and bone development.

Subjects and Methods: Fgfr3 knockout and wild-type mice at 2 months of age and 4 months of age were intraperitoneally injected with PTH intermittently for 4 weeks and then the skeletal responses to PTH were assessed by dual energy X-ray absorptiometry (DXA), micro-computed tomography (μCT) and bone histomorphometry.

Results: Intermittent PTH treatment improved bone mineral density (BMD) and femoral mechanical properties in both Fgfr3−/− and wild-type mice. Histomorphometric analysis showed that bone formation and bone resorption were increased in both genotypes following PTH treatment. PTH treatment increased trabecular bone volume (BV/TV) in WT and Fgfr3-deficient mice. The anabolic response in Fgfr3-deficient and wild-type bone is characterized by an increase of both bone formation and resorption-related genes following PTH treatment. In addition, we found that Fgfr3 null osteoblasts (compared to wild-type controls) maintained normal abilities to response to PTH-stimulated increase of proliferation, differentiation, expression of osteoblastic marker genes (Cbfal, Osteopontin and Osteocalcin), and phosphorylation of Erk1/2.

Conclusions: Bone anabolic effects of PTH were not impaired by the absence of Fgfr3, suggesting that the FGFR3 signaling may not be required for osteoanabolic effects of PTH activities.

Background: Wear debris is known to inhibit the activity of osteoblasts and induces inflammatory reaction, which may contribute to the aseptic loosening of prostheses. Low-dose irradiation (LDI) exhibits a positive effect on osteoblasts and inhibitory effect of inflammation. Here, we test the hypothesis that LDI can promote osseointegration and inhibit the inflammatory membrane formation in the presence of titanium (Ti) particles.

Methods: Twenty-four male New Zealand rabbits were randomly divided into the SHAM and 0.5 Gy groups. After the animal was anesthetized, sterile saline (0.2 ml) was injected into each cavity of the left femur (NS), while the right femur was injected with equal volumes of suspended endotoxin-free Ti particles (3.4×10^5 particles). The Ti implant was then inserted into the hole drilled on the femoral condyle. Two days later, both distal femurs of the animal were exposed to 0.5 Gy X-ray irradiation. The PNP concentration was determined at day 0, 2, 4, and 8 weeks after operation. Trabecular morphology around the implants 8 weeks after operation was assessed by using micro-CT, then the maximum push out force of simples was assessed by biomechanics test. Bone histomorphometry study without decalcification was performed 8 weeks after operation.

Results: At 8 weeks postoperation, the newly formed bone around the implant in the distal femur could be seen in all the groups. Ti particles injection significantly decreased, while 0.5 Gy irradiation increased DA of trabecula around the implant. The 0.5 Gy irradiation significantly increased Tb.Th, BMD, Tb.N, BV/TV, while decreased Sima of trabecula around the implant. The PNP concentration in both groups increased after irradiation and peaked 2 weeks later. The concentration of PNP in the 0.5 Gy group was higher than that in the 0 Gy group at week 2. Histologically, interface membrane formation could be seen around the implant in the 0 Gy−Ti group and the 0.5 Gy−Ti group. However, the thickness of the interface membrane in the 0.5 Gy−Ti group was significantly thinner compared to 0 Gy−Ti group. Fluorescence scanning microscopy showed the extensive xylénol and calcein labeling around the implant. Ti particles injection significantly decreased the MAR, MS and BFR, while 0.5 Gy irradiation significantly increased MAR. Furthermore, the 0.5 Gy irradiation significantly increased push out force for implants. However, there was no significant difference in peak push out force between the 0 Gy group and the 0 Gy−Ti group. In conclusion, LDI may be useful for enhancing the stability of prosthesis when there are no wear particles and for inhibiting the interface membrane formation during the early stage of aseptic loosening in the presence of wear particles.