In the field of bone tissue engineering, three research directions are of vital importance: the osteoinductivity and biocompatibility scaffold, the biomimetic application of growth factors, and animal models to evaluate the effects of surface modification of biomaterial. The aim of this thesis is to explore the related scientific hypothesis based on the abovementioned topics in bone tissue engineering.

In an ectopic rat model, coral hydroxyapatite granules were coated with a layer of octacalcium phosphate, in which BMP-2 was incorporated. This procedure significantly improved the biocompatibility and osteoinductive efficiency of coral hydroxyapatite granules. In order to estimate bone filling materials, a new method was introduced to create peri-implant bone defect in beagle dogs. Stainless steel ligature (SSL) was used instead of the traditional cotton ligature. The SSL method proved to be more rapid, more effective and less complicated than the traditional cotton ligature method. The area of newly formed bone and remaining material in the abovementioned animal models has been regularly evaluated by two methods. Both methods, including manual planimetry and point counting method, are based on Cavalieri’s principle. We compared the accuracy, precision and efficiency of the two methods. The results show that both methods have comparable high precision. Point counting method exhibits higher accuracy and better efficiency than manual planimetry method.