

## Integration of Biphasic Calcium Phosphate Bioceramics Mixed with Autologous Mesenchymal Cells in Osteoporotic Rabbit's Jaw

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**Introduction.** Bone tissue engineering using biphasic calcium phosphate bioceramics as a scaffold saturated by autologous mesenchymal cells in autologous environment of host living organism as bioreactor is one challenge for the substitution of autologous bone grafting. The role of autologous mesenchymal cells for biologisation of inorganic bone substitutes is to improve their osteogenic properties is contradictory between healthy bone and compromised bone and environments. The fate of the transplanted mesenchymal cells has been discussed between new bone formation and early death with release of some osteotropic growth factors, and mediators for cell recruitments remain unknown.

**Material and Methods.** Experimental osteoporosis was induced in 8 2.5 year-old female rabbits by ovariectomy and 1 mg/kg of methylprednisolone daily for 8 weeks. On 4 animals the holes were created in both angles of lower jaw; on the left side filled with a biphasic calcium phosphate bioceramics (HAP/TCP 90/10) granules; on the right side the same granules mixed with autologous fat tissue-derived mesenchymal cells. The two control groups each had 2 rabbits – with the analogous defect of osteoporotic jaw bone without bioceramics and without any defect. After 3 months, bone samples for Hem/Eoz staining and mBiotin-streptavidin method for immunohistochemical detection of collagen I, osteonectin and osteopontin were prepared. Semi-quantitative counting method was used for the quantification of relative frequency of immunohistochemically detected tissue degrading collagen I, osteonectin and osteopontin. Relative frequency of the collagen I type, osteonectin, osteopontin was analysed in three visual fields of a single section. The diameter of the visual field was 1.8 mm when the enlargement was 100 ×, or the diameter the visual field was 0.9 mm when the enlargement was 200 ×. No collagen I type, osteonectin or osteopontin positive cells in the visual field were marked –, rare positive cells were marked 0/+, few positive cells +, moderate ++, numerous +++, a lot of positive collagen I, ON and OP cells were marked ++++.

**Results.** Evaluation of histological slices stained with hem/eoz revealed a different response of host tissue around implanted Hap/TCP granules. In healthy bone granules mainly new formed bone were embedded in, but in osteoporotic bone surrounded by fibrous tissue layer thicker in samples, mesenchymal cells were added.

**Conclusion.** Integration of HAP/TCP granules in defect of osteoporotic rabbit jaw is through encapsulation by fibrous tissue while in healthy bone osseointegration occurs. The addition of autologous mesenchymal cells resulted in a thicker capsule without significant influence on collagen I expression, ON or OP. No signs of inflammation were detected.