

Bone Formation Enhancement by BMP-2-Functionalized Implant Coatings - A Study in Miniature Pigs

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The objective of this investigation was to compare the osteoinductive efficacies of four different BMP-2-carrier modes at a maxillary implantation site in miniature pigs: (i) uncoated implants bearing adsorbed BMP-2; (ii) implants bearing a calcium-phosphate coating upon which BMP-2 was adsorbed; (iii) implants bearing a calcium-phosphate coating into which BMP-2 was incorporated; (iv) coated implants bearing incorporated and adsorbed BMP-2. The screw-like implants (n = 6 per group) were inserted within the partially edentulous maxillae of 18 adult miniature pigs. They were retrieved 1, 2 and 3 weeks later for the histomorphometric analysis of new bone formation (a) along the implant (coating) surface, and (b) within the core of the implant chambers. The analysis revealed a complex biological picture. During the early (1-week) post-implantation phase, BMP-2 stimulated the recruitment and activity not only of osteoblasts but also of osteoclasts. Hence,

particularly along the implant (coating) surface, new bone was both deposited and degraded, and to proportionally different degrees in each group. Within the core of the implant chambers, newly-formed bone was degraded to a lesser degree. By the third week, the implant chambers were generally so well filled with bone as to preclude an adequate discrimination between the osteoinductive efficacies of the three coated-implant groups. Significantly less bone was associated with the uncoated implants bearing adsorbed BMP-2. Our findings reveal: (1) the importance of evaluating osteoinductivity both temporally and spatially; and (2) the need for a more “challenging” experimental implant model.

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