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# In vivo analysis of biocompatibility and vascularization of the synthetic bone grafting substitute NanoBone.

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One of the major challenges in the application of bone substitutes is adequate vascularization and biocompatibility of the implant. Thus, the temporal course of neovascularization and the microvascular inflammatory response of implants of NanoBone (fully synthetic nanocrystalline bone grafting material) were studied in vivo by using the mouse dorsal skinfold chamber model. Angiogenesis, microhemodynamics, and leukocyte-endothelial cell interaction were analyzed repetitively after implantation in the center and in the border zone of the implant up to 15 days. Both NanoBone granules and plates exhibited high biocompatibility comparable to that of cancellous bone, as indicated by a lack of venular leukocyte activation after implantation. In both synthetic NanoBone groups, signs of angiogenesis could be observed even at day 5 after implantation, whereas granules showed higher functional vessel density compared with NanoBone plates. The angiogenic response of the cancellous bone was markedly accelerated in the center of the implant tissue. Histologically, implant tissue showed an ingrowth of vascularized fibrous tissue into the material combined with an increased number of foreign-body giant cells. In conclusion, NanoBone, particularly in granular form, showed high biocompatibility and high angiogenic response, thus improving the healing of bone defects. Our results underline that, beside the composition and nanostructure, the macrostructure is also of importance for the incorporation of the biomaterial by the host tissue.