**Shohei Kasugai**

１.Topic in Research Achievements in the Year 2006

Currently dental implant treatment is predictable and number of patient demanding this treatment is increasing; however, enough bone is required at the place of implant installation. Although autologous bone transplant is gold standard for bone augmentation, inflammation of the donor site and the limitation of the harvestable bone are the problems. Bone substitutes of calcium phosphate materials are used and they are effective as scaffolds for bone regeneration. However, they are less effective than autologous bone because of the lack of signal molecules and cells for bone regeneration. As a bone substitute for implant installation site, material, which can exchange to bone, is ideal. However, the bone substitutes, which are available, are hydoroxyapatite and beta-TCP and they are stable in the body for a long time without exchanging to bone. Thus, we are developing bone substitute, which stimulates bone formation and exchange to bone. Since statins, drugs for hypercholesterolemia, enhance BMP2 expression in osteoblasts, it is possible that local application of a statin promotes bone formation. We observed that local release of simvastatin, one of the statins, from the bone defects stimulated bone formation in rats, rabbits and dogs. Furthermore, we demonstrated that alpha-TCT smoothly exchanged to bone compared to other bone substitute, such as hydroxyapatite and beta-TCP. In addition, we confirmed that alpha-TCP was a superior carrier releasing simvastatin slowly and that the bone substitute, which consists of alpha-TCP and simvastatin, stimulated bone formation exchanging to bone in animal experiments. Based on these results, we started clinical study of this new bone substitute after the approval of Ethical Committee in Dental Hospital. The clinical outcome of this new bone substitute is excellent.

２. Publications in the year 2006

1) Ito Y, Sato D, Yoneda S, Ito D, Kondo H, Kasugai S. Relevance of resonance frequency analysis to evaluate dental implant stability: Simulation and histomorphometrical animal experiments. Clinical Oral Implant Research, in press.
2) Yamada M, Shiota M, Yamashita Y, Kasugai S. Histological and histomorphometrical comparative study of the degradation and osteoconductive characteristics of alpha- and beta-tricalcium phosphate (TCP) in block grafts. Journal of Biomedical Material Research, in press
3) Kuroda S. Kondo H, Ohya K, Kasugai S. Bone increase in rat tibiae by local administration of amino-terminally truncated rhFGF-4(73-206). Tissue Engineering, in press
4) Kihara H, Shiota M, Yamashita Y, Kasugai S. Biodegradable process of alpha-TCP particles and new gone formation in a rabbit cranial defect model. Journal of Biomedical Material Research, Part B: Applied Biomaterials 79B:284-291, 2006
5) Sumida E, Iwasaki Y, Akiyoshi K, Kasugai S. Platelet separation from whole blood in an aqueous two-phase system with water-soluble polymers. Journal of Pharmacological Sciences 101(1):91-7, 2006
6) Endo M, Kuroda S, Kondo H, Maruoka Y, Ohya K, Kasugai S. Bone regeneration by modified gene-activated matrix; Effectiveness in segmental tibial defects in rats. Journal of Tissue Engineering 12(3):489-97, 2006

３. Abstracts in the year 2006

1) ○Myat Nyan. Bone substitute required in dental implant treatment. A study of bone regeneration by simvastatin and calcium sulfate in critical sized rat calvaria defect. Joint Meeting of 8$^{th}$ FDI and 27$^{th}$ Myanmar Dental Congress 2007.1.24-27 Traders

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2) ○Samee M, Kuroda S, Kondo H, Kasugai S. An in vitro gene transfer to rabbit periosteal cells induced osteoblast differentiation whereas an ex vivo gene transfer failed ectopic bone formation in mice within 8 weeks, using human BMP-2 and VEGF. 53rd The Annual Meeting of Orthopaedic Research Society 2007.2.11-14 Convention Center, San Diego, USA
3) Kasugai S. Revolution of prosthetic treatment: Advancement of dental implant and tissue engineering. 15th Alexandria International Dental Congress 2006.11.14-17 Hilton Alexandria Green Plaza Egypt
4) Oda M, Kondo H, Kuroda S, Kasugai S. α-TCP with BMP-2 gene and CaP induces ectopic bone formation. General Session (84th ) and Exhibition of International Association for Dental Research 2006.6.28-7.1. Brisbane, Australia
5) Iino G, Nishimura K, Sato D, Kasugai S, Omura K. Effects of PGE1 application on the rat incisal sockets. General Session (84th ) and Exhibition of International Association for Dental Research 2006.6.28-7.1. Brisbane, Australia
6) Kondo H, Tajirika Y, Damrongrungruang T, Oda M, Kuroda S, Nakano Y, Takano Y, Yamawaki M, Miszusawa H, Ohya K, Kasugai S. Application of gene chip analysis on cementum and periodontal ligament. General Session (84th ) and Exhibition of International Association for Dental Research 2006.6.28-7.1. Brisbane, Australia
7) Tajirika Y, Kondo H, Damrongrungruang T, Oda M, Kuroda S, Nakano Y, Takano Y, Yamawaki M, Miszusawa H, Ohya K, Kasugai S. Laser capture microdissection on undecalcified frozen section of periodontal tissue. General Session (84th ) and Exhibition of International Association for Dental Research 2006.6.28-7.1. Brisbane, Australia
8) Maruo K, Sato D, Machida T, Kasugai S. Effects of simvastatin and alpha-tricalcium phosphate on alveolar ridge augmentation. General Session (84th ) and Exhibition of International Association for Dental Research 2006.6.28-7.1. Brisbane, Australia
9) ○Samee M, Kuroda S, Kondo H, Kasugai S. An in vitro gene transfer of BMP2 and VEGF to rabbit periosteal cells induce osteoblastic differentiation. 52nd The Annual Meeting of Orthopaedic Research Society, 2006.2.11-14, Convention Center, Chicago, Illinois, USA