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ABSTRACTS
A Novel Dental Implant Technology for Early Loading of Implant by Periodic Electrical Stimulation

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(Seoul National University, Republic of Korea)

Effect of Hydroxyapatite-Tricalcium Phosphate Micro-Particles on the Cellular Interaction of In Situ Hyaluronic Acid-Poly(ethylene oxide) Hydrogel

Mi-Sook KIM, Yoon-Jeong CHOI, Gun-Woo KIM, Insup NOH, Yong-doo PARK, Kyu-Back LEE, In-Sook KIM, Soon-Jung HWANG (Seoul National University of Technology, Republic of Korea)

Effect of Molecular Structure of Chitosan-Poly(ethylene oxide) Hydrogel on Cellular Interaction for Tissue Regeneration

Mi-Sook KIM, Yoon-Jeong CHOI, Insup NOH (Seoul National University of Technology, Republic of Korea)

Protein and Cell Adsorption on Polyelectrolytes Surfaces with Various Charge Densities

Hyosook JUNG, Byung-Do KWAK, Giyoong TAE, Young-Ha KIM, Kwanwoo SHIN (Gwangju Institute of Science and Technology, Republic of Korea)

Drug delivery system (including gene and protein delivery)

A Micellar Prodrug Formed from Succinyl Paclitaxel and Lysine Grafted Cyclotriphosphazene

Da Eun HI, Jin Hee YOO, Yong Joo JUN, Youn Soo SOHN (Ewha Womans University, Republic of Korea)

The Study of Antibiotic Drug-Loaded Polymer Films for the Prevention of the Infection of External Fixation Devices

Moon Kyu LEE, Changyang LEE, Dongryul KIM, Ick Chan KWON, Kuiwon CHOI (Korea Institute of Science and Technology, Republic of Korea)

The Neuroprotective Effects of GM-CSF Treated Intraspinally Using a Gel Foam in Rat Spinal Cord Injury Model

Xiaon HUANG, Jung Kyoun CHOI, So Ra PARK, Yoon HA, Hyeonsoon PARK, Seung Hwan YOON, Hyung Chun PARK, Jong Woon PARK, Byoung-Hyun MIN, Byung Hyun CHOI (Inha University, Republic of Korea)
A NOVEL DENTAL IMPLANT TECHNOLOGY FOR EARLY LOADING OF IMPLANT BY PERIODIC ELECTRICAL STIMULATION

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We developed a novel dental implant technology using early bone formation by electrical micro-current stimulator for early loading of implant. It integrated in healing abutment of dental implant. Electrical stimulation makes an early bone formation in areas surrounding implant surface, and this is made possible by changing microenvironments between cells and materials such as titanium and its alloy. The osteoblast forming a new bone is exposed to a periodic micro-current stimulation for a long time and proliferates more rapidly and induces growth factors such as VEGF during stimulation. These proteins accelerate angiogenesis around implants and result in nourishing its environments. In the end, bone mineral density is increased and surrounding tissues can more effectively support the implanted metals.

In this paper, in order to implement small sized stimulation system in healing abutment of dental implant, we needed a small sized stimulator chip that could be operated on a tiny battery. Thus, we designed a current stimulator chip using 0.35μm fabrication process of SAMSUNG semiconductor through the 41st IDEC MPW program. Stimulation parameters of the chip are fixed with 120μs of duration, 100Hz of pulse rate and 20μA/cm² of amplitude and power is delivered by a serial connected silver oxide battery(SR416SW, Sony) of which dimension is 1.65mm of thickness and 4.8mm of diameter. The chip consumed 142μW power and lasted 7 days in an implanted site. The fabricated chip is packaged in a healing abutment made with Poly-carbonate insulating materials.

We implanted the current stimulator system into the 10 dogs(Beagle). After pulling out premolar of maxillary and mandibular, wounded sites were stabilized for 45 days. Then, the system was implanted in mandibular first premolar with the control. Electrical stimulation was applied for 1 weeks and the test group was sacrificed at 2 weeks after stimulation. Histological specimens with H&E and Masson Trichrome staining were made and histomorphometrically analysed with image analyzer.

A new bone formation was observed around implants in the experimental group. The area of a new bone was increased from 13.77% to 43.93% compared to that of control. These results suggest that our newly developed system is effective in the early bone formation around the surface of implant. It can be a useful method in clinical application for the early loading of implant.