文部科学省 私立大学学術高度化推進事業
学術フロンティア推進事業（平成 13 年度～平成 17 年度）シンポジウム

Calcium Phosphates as Biomaterials

開 催 日　　平成 17 年 4 月 18 日（月）16：00 ～ 19：00

会　　場　　松戸歯学部校舎棟 4 階　411 教室

16：00～開会の辞　　事業代表者 根本君也 教授

学部長の挨拶　　松戸歯学部長 大竹繁雄 教授

特別講演　　＜座長：池見宅司　教授＞

16：05～16：50

"Next Generation Calcium Phosphate Cements"

ADAF, Paffenbarger Research Center　　Laurence C. Chow 教授

16：50～17：35

"Calcium Phosphate Coatings on Implants：Electrochemical eposition or Chemical Precipitation Methods"

New York University College of Dentistry　　Racquel Z. LeGeros 教授

17：35～18：20

"Calcium Phosphates as Biomaterials"

ADAF, Paffenbarger Research Center　　Shozo Takagi 教授

18：20～18：35

討　　論

一般講演　　＜座長：西山典宏　助教授＞

18：35～18：45

"骨芽細胞様細胞に対するリン酸カルシウムの効果"

日本大学松戸歯学部　　小方　頼昌　教授

18：45～18：55

"チタンインプラントへのリン酸カルシウム薄膜コーティング"

日本大学松戸歯学部　　早 川　　徹　講師

18：55～19：05

"歯槽骨補填材としてのリン酸カルシウムセメント（CPC）の有用性について"

日本大学松戸歯学部　　平山　聡司　講師

19：05～閉会の辞　　シンポジウム責任者 前田隆秀 教授

Calcium Phosphates as Baiomaterials

Title: Next Generation Calcium Phosphate Cements

Laurence C Chow, Ph.D. American Dental Association Foundation, Paffenbarger Research Center

Title: Calcium phosphate coatings on implants: electrochemical deposition or chemical precipitation methods.

Racquel Z LeGeros, Ph.D. New York University College of Dentistry

Title: Calcium Phosphates as Biomaterials

Shozo Takagi, Ph.D. American Dental Association Foundation, Paffenbarger Research Center

Next Generation Calcium Phosphate Cements

Due to their good physical (self-hardening, moldable, strength, etc.) and *in vivo* (biocompatible, osteoconductive, resorbable) properties, calcium phosphate cements (CPCs) and related materials have the potential to replace allografts and eventually autografts for bone defects repair. Currently, several CPCs have been approved for clinical use throughout the world. However, at present time their uses remain largely limited to craniofacial and selected non-load bearing orthopedic applications. Efforts are being made to build into CPC materials those attributes that are of critical importance for various clinical applications. These include (1) a wide range of hardening times and with high washout resistance, (2) a range of in vivo resorption rates, (3) elastomeric qualities that can reduce implant fracture or accommodate inherent micro movements within the bone tissues, (4) macropores of various shapes and pore volumes, (5) significantly greater flexural strengths by fiber reinforcement, (5) inclusion of osteoinductive factors, and (6) premixed cement pastes that are stable in the package and hardens rapidly after delivery to defect site. It is anticipated that further research will lead development of CPC materials with properties that are uniquely suitable for specific clinical applications.

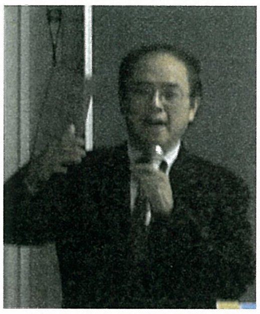
Calcium Phosphate Coatings on Implants: Electrochemical Deposition or Chemical Precipitation Methods.

Commercial orthopedic and dental implants coated by plasma-sprayed 'HA' combines the strength of titanium (Ti) or Ti alloy and the bioactivity of HA. However, the plasma-spray coating method has the following disadvantages: coating obtained has inhomogenous composition (e.g., variable concentrations of HA and amorphous calcium phosphate, ACP, hence variable HA/ACP ratios from between the outer and inner layers of the coating leading to unpredictable biodegradation; does not permit coating of implant with complex geometry; and high temperature does not allow incorporation of bioactive molecules. The purpose of this study was to deposit octacalcium phosphate (OCP) and different types of apatites (calcium deficient apatites, AP; fluoride-substituted (FAP) and carbonate-substituted (CHA) apatites on Ti (Ti6Al4V) substrates using pulse-modulated electrochemical deposition (ECD) method. Studies showed that using pulse modulated ECD, desired homogeneous coating composition (OCP, AP, FAP, CHA) and thickness (10μ or thicker) can be obtained at low temperature (25, 37 or 60°C) by appropriate adjustments of pH, temperature and electrolyte composition.

Calcium Phosphates as Biomaterials

Calcium phosphates have been subjects of the intensive research in the last decades. There are two types of calcium phosphate materials: Bioactive and bioresorbable. For example, sintered hydroxyapatite has been described as bioactive but nonresorbable. Biphasic calcium phosphate, calcium phosphate cements that form precipitated hydroxyapatite or other calcium phosphate phases, certain calcium phosphate coatings, bioglass are bioresorbable. Bioactive materials are biocompatible, and are directly bonded to bone. Bioresorbable materials are biocompatible and are resorbed by osteoclast, leading to new bone formation. A calcium phosphate cement consisting of tetracalcium phosphate and dicalcium phosphate anhydrous or dicalcium phosphate dihydrate reacts with water to harden and form nano-HA crystals as product, as a result it is biocompatible and bioresorbable. Therefore, these calcium phosphate biomaterials are useful in medical and dental applications. These include: an endodontic filling material, an implant material for periodontal bone defects and alveolar ridge augmentation, a coating material to stabilize metal implants. The presentations given in this symposium will highlight some of the most important advances in the use of electrochemical deposition or chemical precipitation methods to form calcium phosphate coatings on metal surfaces and in calcium phosphate cements.

2005年4月18日（月）　学術フロンティア推進事業シンポジウム



講演者 Laurence C.Chow 教授

講演者 Racquel Z.LeGeros 教授

講演者 Shozo Takagi 教授

講演者　小方頼昌教授

講演者　早川　徹講師

講演者　平山聡司講師

所　長　根本君也教授