# research report 06/07 Faculty of Dentistry

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# CONTENTS

Foreword by Vice Dean (Research)	01
Faculty Research Strategy	02
Strategic Research Initiatives	03-05
Graduate Research Programmes	06-07
Undergraduate Research Opportunities Programme	08-09
Graduate Coursework Programme	10
Research Highlights	11-14
Completed Research Projects in FY 2006/07	15-18
New Research Projects awarded in FY 2006/07	19-20
Research Collaborations	21
Research Achievements	22-23
Research Statistics	24-25

The Faculty of Dentistry has embraced the aspiration of NUS in its relentless pursuit of a Global Knowledge Enterprise. Strategies to transform University into a research-intensive institution while maintaining the solid teaching reputation that has earned us international recognition are being constantly fine-tuned.

In the light of the fast-evolving research landscape, we will have to be nimble in capitalizing on increasing external grant funding streams, initiate and consolidate high quality research activities as well as recruiting and nurturing research talent to build sustainable intellectual capital in order to attain the next research plane with international impact. The Faculty needs to continue the constant quest of identifying niche research areas that would significantly advance the Faculty's mission of improving oral health which ultimately impacts on the holistic well-being of our patients and ultimately, quality of life.

In the Academic Year 2006, the 2 research milestones of note were the allocation of the additional research space at Level 3 of the Defence Science Organization (DSO) building, as well as the initiation and conception of the Oral Tissue Repositories (OTR) under the auspices of the Center for Craniofacial & Regenerative Biology (CCRB), one of the strategic research initiatives. OTR-CCRB aims to position itself as a core research facility that would complement

the two other research initiatives, the Dental Biophotonics & Biomaterial Program (DBBP) and the Craniofacial Clinical Research Unit (CCRU), to advance translational clinical research.

As I reflect on my stimulating first year as Vice Dean for Research, I am heartened to have the support of various committed academic and administrative colleagues who work tirelessly under the faculty leadership.

Please let me end with a quote from the famous physicist, Max Planck.

'All matter originates and exists only by virtue of a force... We must assume behind this force the existence of a conscious and intelligent Mind. This Mind is the matrix of all matter.'

Let us persevere and cultivate this Mind as we thrust forward along this winding research journey together towards our destination.

Associate Professor Varawan Sae-Lim Vice Dean (Research)



Let us perseveringly cultivate this Mind as we thrust through the long winding research journey together towards the destination.



Faculty Mission: To improve Oral Health through Academic Excellence, High Impact Research and Quality Clinical Service

**Research Mission:** To improve Oral, Dental and Craniofacial Health and the Delivery of Clinical Care

Strategic Research Initiatives

Centre for Craniofacial Regenerative Biology (CCRB) Dental Biophotonics and Biomaterials Programme (DBBP) Craniofacial Clinical Research Unit (CCRU) Since its conception in June 2006, the 3 strategic research initiatives aim to develop research in oral, dental and craniofacial health, and delivery of clinical care.

# The Centre for Craniofacial and Regenerative Biology (CCRB)

Director: Assoc Prof Varawan Sae-Lim

#### **Overview:**

The Center for Craniofacial & Regenerative Biology (CCRB) complements other Research Initiatives in facilitating faculty research elucidating the mechanisms and approaches to craniofacial regenerative biology. The current strength of CCRB is in the cell-based research as one of the three crucial arms in tissue engineering/regeneration. This involves the use of human embryonic and adult stem cells with or without scaffold technologies.

#### Progress in FY 2006/07:

CCRB plans to set up an Oral Tissue Repository (OTR) as a core research facility following International Society for Biological and Environmental Repositories (ISBER)'s Best Practices for Repositories for collection, storage and retrieval of human biological materials for research. It hopes to expedite the collection and banking of the to-be-discarded viable soft / hard oral tissue (dental pulp, gingiva, periodontal tissue, oral mucosa, bone, etc) made available from routine surgical procedures for various specific research investigations. The establishment of the common-sharing CCRB-OTR facility will allow Faculty of Dentistry and the larger NUHS and NUS research community to capitalize on cell based research including the fast evolving stem cells area, to advance translational clinical research in the craniofacial and other entities. CCRB-OTR hopes to facilitate multi-disciplinary, multi-institutional and international collaboration that would advance the Faculty's mission of improving oral health for the well-being and quality of life of patients.

#### **Future Directions**

Faculty is currently planning renovation work for OTR to be located at the current oral histo-pathological lab that will be relocated to DSO, at DMRI.

# The Dental Biophotonics and Biomaterials Programme (DBBP) Director: Assoc Prof Stephen Hsu

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#### **Overview:**

This program is composed of two groups. The biophotonic group leverages on the platform technology of biophotonics to address scientific questions related to dental hard tissue diseases and to understand and regulate the mechanisms of demineralization of dental tissues and biofilm formation. The biomaterial group focuses on the characterization and development of biomimetic materials for restorative therapies and prevention, including biomechanics research on oral implants.

#### Progress in FY 2006/07:

The number of research grants and awards achieved under DBBP has well exceeded the targeted projections. Moreover, research funding from one external research agency, BMSI was secured. The team also won two international awards. The Biophotonic / Biofilm team has also filed a patent under the Patent Cooperation Treaty (PCT), and it has been published in Dec 2006.

#### **Strategic Plans and Future Directions:**

Research activities in DBBP in the next 2-3 years will focus on four main theme/directions listed below:

• Tooth-biofilm interaction: to study the mechanisms involved in the interplay of biofilm and physico-chemical properties of dental tissues (enamel/dentin) modulated by various mechanical, chemical, photothermal treatments. Various biofilm models will be employed, ranging from the simple flow cell to the sophisticated Multiplaque Artificial Mouth (MAM).

- Laser-tissue interaction: to characterize the photochemical and photothermal effects of lasers on dental tissues (enamel/dentin) and to apply these effects for strengthening enamel, disinfecting root canals, and fluoride incorporation into dental tissues.
- Bio-imaging research: to model anatomically the human head utilizing laser imaging modalities for planning orthodontic treatment and jaw surgery.
- Biomaterial research: to examine the relationship between tooth structures and material property gradients, with the objective of developing biomimetic materials to restore the mechanical integrity of decayed, damaged, or restored teeth.

These four themes/strategies will work complimentary to each other to provide fundamental evidence of novel preventive and/or therapeutic dental treatments before bringing them to be tested in clinical trials.

# Craniofacial Clinical Research Unit (CCRU)

Director: Assoc Prof Jennifer Neo

#### **Overview**

Clinical research is an important entity in the continuum of translational research as it must finally benefit the patient in the long run. Being a small faculty, clinical research was relatively sporadic and occasional as it involved a heavy commitment on the part of the investigator. Recognizing the significance of this, the faculty mooted the Craniofacial Clinical Research Unit (CCRU) initiative at a strategic retreat, principally to facilitate and coordinate clinical research in the faculty and this was established at the end of 2006 with the following objectives :

- 1. to provide a platform for clinicians and basic scientists to interact and establish joint research activity
- 2. coordinate and consolidate clinical research activities under this initiative
- 3. to engage industry partners for collaborative research

#### Progress in FY 2006/07:

The unit recruited a Clinical Trials coordinator to assist in the administration, logistics and collation of data for clinical projects. Besides assisting in a couple of clinical trials, the unit hosted visits from dental industry to expose the faculty's research capabilities and facilities and to discuss collaborative research opportunities.

#### Visits from Dental Industries

#### Dentsply DeTreyGmbH, Germany

Mr Marthias Kraus, Director of Marketing Dr Markus Kopp, Clinical Research Manager Rebecca Yeung, Professional Relationship Manager Ms Virginia Cheng, Director of Marketing



From Left to Right: Rebecca Yeung, A/P Varawan Sae-Lim, A/P Jennifer Neo, Viginia Cheng, Dr Marthus Kopp, A/P Keson Tan, Prof Lin Chun-pin, Mr Marthias Kraus

#### Kuraray Medical Inc, Japan

Dr Masayuki Asada, Manager, Planning and Development Department, Dental Materials Division

Kazuyoshi Taki, General Manager, Asian and Pacific Dental Material Division



Left to Right : A/P Hien Chi Ngo, Mr Kazuyoshi Taki, Dr Masayuki Asada, A/P Jennifer Neo

#### Ivoclar Vivadent AG, UK

Michael Dieter, Head of Professional Services

#### Johnson and Johnson Asia Pacific, Singapore

Mr Duncan Yu, Associate Director, Oral Care Professional Affairs-Asia Pacific

#### DMG, Germany

Dr Susanne Effenberger, Professional Service Manager Annette Erdt, Area Sales Manager-Asia Pacific

#### **Future Directions:**

As part of its future plans, the unit intends to involve more staff in clinical research by focusing on 2 strategies :

- The set-up of a couple of thematic multi-disciplinary cluster of projects. One of these is Clinical Cariology riding on the platforms of an artificial mouth, biofilm and fluoride laboratory
- Explore the establishment of research databases

Research Statistics of the 3 Research Initiatives in FY 2006/07 \* Research Funding in FY 2006/07 \*





# **Master of Science (MSc)**

#### 1) Dr. Adeela Rafique

Role of Water on the Mechanical Characteristics of Structural Dentine Supervisor: Dr. Anil Kishen

#### 2) Dr. Tian Xianfeng

In Vitro and In Vivo Osteogenesis of Human Embryonic Stem cells with 3-D Porous PLGA Scaffold

Supervisors: Dr. Victor Fan, A/P Yeo Jin Fei

#### 3) Dr. Huang Li

Effects of Heat & Organic Matrix on Enamel Demineralization & Diffusion Supervisor: A/P Stephen Hsu

#### 4) Dr. Tarun Kumar Maheshwari

Molecular Profile of Periodontal Tissues Following Tooth Replantation Supervisors: A/P Varawan Sae-Lim, Dr. George Yip, Dr. Henry Yang

#### 5) Dr. Pallavi Uppangala

A Comparative Study of the Biological and Physical Properties of Viscosity Enhanced Root Repair Material (VERRM) and MTA Supervisor: A/P Yeo Jin Fei

#### 6) Mr. Lu Kai

Assessment of Mitomycin C - Induced Cytotoxicity and Genotoxicity Utilizing Somatic Progenies of Human Embryonic Stem Cells Supervisor: A/P Cao Tong

#### 7) Miss Sui Lin

The Role of Wnt/beta-catenin Signalling in Directing Stem Cell to Chondrogenic Lineage Differentiation Supervisor: A/P Cao Tong

#### 8) Dr. Md Nazrul Islam

Bone Regeneration with PLGA Bioscaffold in Animal (Goat) Model & Human Supervisors: Dr. Victor Fan, A/P Yeo Jin Fei

#### 9) Miss Fu Xin

In Vitro Differentiation of Osteogenic and Adipogenic Cells From Human Embryonic Stem Cells

Supervisor: A/P Cao Tong

#### 10) Miss Shibi Mathew

Inter Radicular Causes of Persistent Endodontic Infections Supervisor: Dr. Anil Kishen

#### 11) Dr. Annie Shrestha

Rapid Optical Sensor to Monitor Caries Activity in Children Supervisor: Dr. Anil Kishen

#### 12) Dr. Lutfun Nahar

Molecular Characterization of Neuro-vascular Tranes Associated with Immediate Loading Implants in an Animal Model Supervisor: A/P Yeo Jin Fei

#### 13) Mr. Do Dang Vinh

Tooth Replantation Supervisors: A/P Varawan Sae-Lim, Dr. Phan Toan Thang

#### 14) Dr. Subakumar Lakshmi

Bone Allografts and their Use in Oral Surgery Supervisor: A/P Yeo Jin Fei

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# **Doctor of Philosophy (PhD)**

#### 1) Dr. Deng Bin

Inverse Analysis of Dental Implant Systems using Finite Element Method Supervisors: A/P Keson Tan, A/P Liu Gui Rong

#### 2) Dr. Nyi Lay Maung

Characterization of Enamel Diffusion Modulated by Er: YAG Laser Supervisor: A/P Stephen Hsu

#### 3) Dr. Hla Myint Htoon

Oral Health Promotion Programme for Diabetics in Singapore Supervisor: A/P Lim Lum Peng

#### 4) Dr. Soh Mui Siang

Composite Cure and Post-gel Shrinkage with Different Halogen and LED Curing Lights Supervisors: A/P Adrian Yap, Dr. Alan Sellinger

#### 5) Dr. Wang Xiaoyan

Interaction of Environmental Calcium / Phosphate and pH with Glass Ionomer Restoratives

Supervisors: A/P Adrian Yap, A/P Hien Chi Ngo, Dr. Zeng Kaiyang

#### 6) Mr. Chung Sew Meng

Development of Depth-sensing Microindentation Strategies for Characterization of Dental Composites Supervisors: A/P Adrian Yap, A/P Tsai Kuo Tsing, A/P Lim Chwee Teck

#### 7) Dr. Khoo Suan Phaik

Biopsychosocial Characteristics as Predictors of Treatment Outcome of Temporomandibular (TMD) Patients with Symptoms of Pain Supervisors: A/P Adrian Yap, Dr. Chan Yiong Huak

#### 8) Mr. Saji George

Investigation on the Bacterial Biofilm in Root-Canal Dentine and Elimination by Modified Light Activated Therapy Supervisor: Dr. Anil Kishen

#### 9) Dr. Gao Xiaoli

Caries Status among Preschoolers in Singapore and Development / Validation of Caries Risk Assessment / Prediction Models Supervisor: A/P Stephen Hsu

#### 10) Dr. Sum Chee Peng

Interaction of Enterococcus Faecalis to Root Canal Dentine; Role of Direct Action of Chemicals on Dentine Substrate Supervisor: Dr. Anil Kishen

#### 11) Dr. Tang Ning

Role of Lipid Mediators in Orofacial Pain Supervisor: A/P Yeo Jin Fei

#### 12) Dr. Hu Xiaoli

Thermal Effect on Oral Bacterial Adhesion to Dental Enamel Supervisor: A/P Stephen Hsu

#### 13) Dr. Liu Hua

Immunological Property of Bone Marrow Mesenchymal Stromal Cells Supervisor: A/P Cao Tong

#### 14) Mr. Toh Wei Seong

Mesodermal Induction and Chondrogenic Differentiation of Human Embryonic Stem Cells for Derivation of Lineage-committed Chondroprogenitors and Chondrocytes

Supervisor: A/P Cao Tong

#### 15) Dr. Vinoth Kumar S/O Jayaseelan

Human Embryonic Stem Cell for Genotoxicity Testing Supervisor: A/P Cao Tong

#### 16) Mr. Zhang Xu

Understanding Demineralization in Dental Hard Tissues and Develop Strategies to Biomimatically Remineralize Demineralized - Dental Hard Tissue Supervisor: Dr. Anil Kishen

17) Mr. Bhadravathi Eswara Lokesh Optical Suturing of Dentine Tissues Supervisor: Dr. Anil Kishen

7

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Undergraduate Research Opportunities Programm

# **Undergraduate Research Opportunities Programme (UROP)**

- Accuracy of Lateral Cephalometric Tracing Performed by Dental Undergraduates and Postgraduates as Compared to the Gold Standard Chay Pui Ling (Miss) Chen Weimin, Evelyn (Miss) Teow Wan Wah (Miss) Supervisors: A/P Kelvin Foong, A/P Keng Siong Beng
- 2) Acid Neutralizing Capability of Foods on Plaque pH after Coca-Cola Consumption Bey Yee Hau Yang Jingrong (Miss) Liu Muzhi
  Supervisor: A/P Stephen Hsu
- 3) Comparison of the Efficacy of Single Splint and Dual Splint Therapy on Sleep Bruxism; A Pilot Study
  Lim Wei-Song
  Lin Gengfeng @ Lin Duanli
  Soh Jiansheng, Dennis
  Wu Shenhua
  Supervisors: A/P Adrian Yap, A/P Keng Siong Beng

- 4) Fiber Optic Nack Scatter Spectrophotometer:
  A Method for Assessment of Incipient Enamel Demineralization and Remineralization Lee Tien Tien (Miss)
  Lim Wanyi (Miss)
  Song Lin Lin (Miss)
  Supervisor: Dr. Anil Kishen
- 5) Dental Anxiety among Patients in an Undergraduate Dental Clinic Chan Liang Bran Tan Huan Kiat, Kenneth Tay Xue Li (Miss) Wu Siwen (Miss) Woo Fengyi (Miss) Supervisor: Dr. Wong Mun Loke
- 6) An Investigation into the Role of Flowable Composite Resins and its Influence on Microleakage of Class II Composite Restorations Kok Chen Hong, Stanley Png Lu Lin (Miss) Lee An Qi (Miss) Chia Puay Koon (Miss) Chng Si'en, Tabitha (Miss) Supervisor: Dr. Lim Kian Chong

7) Cytotoxicity Testing of Toothpastes on L929 and CRL-1486 Cells
Boey Mao Jie
Eng Zhen Feng, Clement
Ee Zhongren, Jonathan
Mohamed Shafiq Bin Abdul Aziz
Supervisor: A/P Cao Tong

8) A Quantitative Analysis of Candida Albicans in Oral Lichen Planus
Nijamuddeen Abdul Latiff
Lee Aik Sheng, Adrian
Zhang Zhixiang
Lee Yonghe
Tan Yew Choon Charles
Supervisor: A/P Yeo Jin Fei

# Faculty Research Day 2006

The Undergraduate Research Opportunities Programme (UROP) aims to cultivate research interest and provide every undergraduate in the Faculty of Dentistry, a chance to perform supervised research work. Students work in groups under the guidance of a research mentor to explore research ideas and test hypotheses. The programme commences in Year 2 Term 3 and lasts for about 2 years. Each group has to submit a final research report at the end of the programme. Selected groups will then present their findings during the annual Faculty Research Day. Faculty Research Day 2006 was held on 3 November 2006 and saw eight groups presenting their findings to a panel of judges comprising Prof Chew Chong Lin, A/P Lim Lum Peng and A/P Varawan Sae-Lim.

The results of the competition were as follows:



Starting from the left: A/P Keng Siong Beng, Chay Pui Ling (Miss), Chen Weimin, Evelyn (Miss), Teow Wan (Miss) and A/P Kelvin Foong

#### Winning Group

Group Members:	Chay Pui Ling (Miss), Chen Weimin, Evelyn (Miss)
	and Teow Wan Wah (Miss)
Supervisors:	A/P Kelvin Foong and A/P Keng Siong Beng
Project Title:	Accuracy of Lateral Cephalometric Tracing
	Performed by Dental Undergraduates and
	Postgraduates as compared to the Gold Standard.

The winning group represented the Faculty at the Dentsply Student Clinician Programme during the SEAADE-IADR meeting.

#### 1<sup>st</sup> Runner-up

Group Members:	Lee Tien Tien (Miss), Lim Wanyi (Miss)		
	and Song Lin Lin (Miss)		
Supervisor:	Dr. Anil Kishen		
Project Title:	Fiber Optic Back Scatter Spectrophotometer:		
	A Method for Assessment of Incipient Enamel		
	Demineralization and Remineralization		

The 2<sup>nd</sup> place winners represented at SEAADE.

#### 2<sup>nd</sup> Runner-up

Group Members:	Kok Chen Hong, Stanley, Png Lu Lin (Miss),
	Lee An Qi (Miss), Chia Puay Koon (Miss),
	Chung Si'en, Tabitha (Miss)
Supervisor:	Dr. Lim Kian Chong
Project Title:	An Investigation into the role of Flowable Composite
	Resins and its influence on Microleakage of Class I
	Composite Restorations.

The 3<sup>rd</sup> place winners represented at the Asia Pacific Dental Students Association Scientific Competitions (APDSA).

# Master of Dental Surgery (MDS)

#### Endodontics Year 3

#### 1) Dr. Lim Toh Seong, Andy

Evaluation of Novel Culture Medium for Rapid Proliferation of Periodontal Ligament Fibroblast Supervisors: A/P Varawan Sae-Lim, Dr. Phan Toan Thang

#### Year 2

#### 1) Dr. Tay Li Chye

Effects of Sonic Irrigation on Smear Layer Removal at the Apical 1/3 of Root Canals Supervisors: Dr. Patrick Tseng, Dr. Anil Kishen

2) Dr. Chung Tze Onn

Effects of Periodontal Cell Sheet on Delayed Replanted Teeth in Dogs - A Pilot Study Supervisors: A/P Varawan Sae-Lim, Dr. Phan Toan Thang

#### **Oral & Maxillofacial Surgery (OMS)** Year 3

#### 1) Dr. Rahul Harshad Nagadia

Spatial Arrangement of IDN in Local Chinese Population

Supervisor: Dr. Andrew Tay Ban Guan

#### Year 2

#### 1) Dr. Intekhab Islam

A Retrospective Analysis of Dental Implant Failure Rates Complications and Associated Risk Factors Supervisors: Dr. Goh Bee Tin,

Dr. Andrew Tay Ban Guan

#### 2) Dr. Pujan Rai

To Determine the Incidence of Nerve Injury After **3rd Molar Surgery** Supervisors: A/P Yeo Jin Fei, Dr. Aidan Yeo

#### 3) Dr. Norhisham Bin Mohamed

Effect of Bioresorable 3-dimensional Polyceprolcetone (PCL) Scaffold in Immediate Implant Placement on Boneto-implant Contact and Implant Ptability in Maxillary and Mandibular Bone in the Goat Model Supervisors: Dr. Goh Bee Tin,

Dr. Andrew Tay Ban Guan

#### **Orthodontics** Year 3

#### 1) Dr. Chng Chai Kiat

A New Aesthetic Resin Braided Arch Wire: A Comparative Frictional & SEM Study Supervisors: A/P Kelvin Foong, Prof Chew Chong Lin

#### 2) Dr. Koh Wei Ching, Robyn

The Frictional Evaluation of Various Configurations of Aesthetic Brackets and Archwires Supervisor: A/P Kelvin Foong

#### 3) Dr. Mah Kuan Seet, Michael

A 3-Dimensional Frontal Evaluation of Occulusal **Plane Changes** Supervisors: A/P Kelvin Foong, A/P Ashraf Kassim

#### 4) Dr. Wee Teng Yau

3D Analysis of Orthodontic Tooth Movement in the Mandibular Dental Arch with 1<sup>st</sup> and 2<sup>nd</sup> Premolar Extractions Supervisor: A/P Kelvin Foong

#### Year 2

#### 1) Dr. Boey Pui Yunn Soft Tissue Facial Profiling of Orthodontic Patients Supervisors: Dr. Soh Jen, Dr. Chew Ming Tak

2) Dr. Lee Ping, Geraldine Oral Health Related Quality of Life in Orthodontic Patients: A Pilot Study

Supervisors: Dr. Soh Jen, Dr. Chew Ming Tak

#### 3) Dr. Lim Ming Yee

Palatal and Arch Form Changes Associated with Class II Orthodontic Treatment Supervisors: Dr. Soh Jen, A/P Ong Sim Heng

# **Periodontics**

#### Year 2

#### 1) Dr. Ang Chee Wan

Alveolor Ridge Preservation with Polycoplactose Scaffold Compared to Extraction Alone for Implant Site Development: A Clinical, Radiographs and Histologic Study in Humans Supervisors: A/P Lim Lum Peng,

Dr. Chung Kong Mun

#### 2) Dr. Chang Kok Meng

The Effects of Periodontal Intersection on the Holistics Status of a Diabetic Population Compared with Health Controls Supervisor: A/P Lim Lum Peng

#### 3) Dr. Cheok Be Chen, Christina

The Biological Effects of Non-surgical Periodontal Therapy on Diabetics and Healthy Individuals Supervisor: A/P Lim Lum Peng

# **Prosthodontics**

#### Year 3

#### 1) Dr. Nguyen Thi Ouvnh Huong

Load Fatigue Performance of Implant-Ceramic **Abutment Combinations** Supervisors: A/P Keson Tan, Prof Chew Chong Lin

#### 2) Dr. Tapan Nalin Koticha

Accuracy of Fit at Interface of Four Implant-Abutment Systems Supervisor: A/P Keson Tan

# MSc Project

Thesis Title:	Effects of Central Nervous System Free Fatty Acids, Prostaglandins
	and Lysophospholipids on Allodynia in a Mouse Model of Orofacial
	Pain
Student:	Wajiha Hassaan Vahidy
Supervisors:	A/P Yeo Jin Fei and A/P Ong Wei Yi

#### Abstract

Phospholipase A2 (PLA2) belongs to a family of enzymes that liberates arachidonic acid while catalyzing membrane glycerophospholipids, the same reaction also produces lysophospholipids. This study shows how free fatty acids, prostaglandins and lysophospholipids affect responses to mechanical facial stimulation in a mouse model of orofacial pain. These compounds were injected in the right lateral ventricle of brain followed by facial carrageenan injections which causes allodynia (Vahidy et al., 2006). Behavioral responses were recorded. Intracerebroventricular (ICV) injection oleic acid and arachidonic acid had anti-allodynic effects; injection of prostaglandin Es, tested lysophospholipids and platelet activating factor increased allodynia. Injection of the PAF receptor antagonist also showed an anti-allodynic effect. These findings show that lipid mediators are involved in signal transduction process related to nociception and PAF antagonists could be useful for treatment of pain states.

Objectives: The present study was carried out to determine whether central free fatty acids, their metabolites and lysophospholipids would have a pro- or anti-allodynic effect after facial carrageenan injections in a mouse model of oro-facial pain.

Methods: Four free fatty acids, 3 prostaglandins, 4 lysophospholipids and 1 PAF antagonist were tested. 60 adult male Balb/c mice were anesthetized and steriotaxically injected with 5  $\mu\ell$  of a 2 mM solution of the compounds and vehicle controls into right lateral ventricle. This was followed by facial injection of carrageenan over the right maxilla (Ng and Ong, 2001; Vahidy et al., 2006) to induce pain/allodynia.

Behavioral responses were recorded by von Frey Hair filaments at 24hr before and 8, 24 and 72 hr after the surgery, at the carrageenan injected area. The scoring procedure used was modified from Vos et al., 1994. The five categories of response observed with grades are: no response (0), detection (1), withdrawal reaction (2), escape/ attack (3), asymmetric face grooming (4). The grade of each category was multiplied by its frequency observed in each probe; values were summed to obtain the response of one probe. Each mouse was probed 20 times; summed values of 20 probes were added to get 'Response' score of each mouse.

Response = 
$$\sum_{j=1}^{20} \left[ \sum_{i=0}^{4} i \times frequency_j \right]$$

i = grade of categories of behavior, j= probes of von Frey hair filament

**Results**: Mice with Arachidonic and Oleic acid showed decreased responses after surgery. Mice injected with prostaglandins and lysophospholipids showed more responses after surgery. Mice with PAF showed more responses after surgery but PAF receptor antagonist appeared to show decreased development of allodynia. All comparisons were made with control groups.

**Conclusion:** It was concluded that ICV injection of AA and OA can decrease allodynia (Vahidy et al., 2006). ICV injection of the lysophospholipids LPA, LPC and PAF were found to increase behavioral responses and allodynia in mice, showing an important role of CNS lysophospholipids in nociception. ICV injection of a PAF receptor antagonist was found to significantly decrease allodynia. These findings suggest that PAF antagonists could be useful for treatment of pain states (Vahidy et al., 2006).

# **PhD Project**



Caries Status among Preschoolers in Singapore and Development /Validation of Caries Risk Assessment / Prediction Models Dr. Gao Xiaoli A/P Stephen Hsu

This project was awarded the International Association for Dental Research (IADR) Lion Dental Research Award for Junior Investigator, at 85<sup>th</sup> Annual Meeting of the IADR, held in March 2007, in New Orleans, USA Abstract

Thesis Title:

Student:

Supervisor:

Background: Epidemiological data for the oral health of preschoolers in Singapore are scarce. Although the importance of caries risk assessment (CRA) has been widely recognized, clinically practical models are yet to be established.

Objectives: The objectives of this study are to profile the caries prevalence, incidence, and disease patterns among preschoolers in Singapore and to develop/validate biopsychosocial CRA models for children.

Methods: With a questionnaire, oral examinations, and biological (salivary, microbiological, and plaque pH) tests, a population-based prospective study was conducted among 1,782 preschoolers aged 3-5 years in 13 randomly selected public kindergartens. The follow-up examination was carried out 12 months later.

Results: 40% of children were affected by caries, with mean (SD) deft and defs of 1.54 (2.75) and 3.30 (7.49), respectively. In 12 months, 44% of children developed new caries. Multiple caries risk factors/indicators have been identified, including low socioeconomic status, prolonged breastfeeding, bedtime feeding, bedtime sweets, insufficient toothbrushing or fluoride applications etc. High levels of mutans Streptococci (10<sup>5</sup> CFU/ml saliva), Lactobacilli (>10<sup>3</sup> CFU/ml saliva), and high plaque acidity (pH < 6.0) were found among 53%, 29%, and 27% of children, respectively, and were indicative of high caries risk. The community-screening CRA model, requiring only a simple questionnaire, reached a sensitivity/specificity of 82%/81% in identifying "high-risk" children. With biological tests, the sensitivity/specificity of the full-scale model reached 90%/90% in predicting "any-risk" in 1 year. The combination of these models provides options for various applications at community and clinical settings, to achieve cost-effective caries control and optimal treatment planning.

Conclusion: Caries remains a serious oral health problem for preschoolers in Singapore. Early identification of high-risk group and risk-based prevention/intervention are of paramount importance and is potentially achievable using the multifactorial CRA models established in this study.

#### Faculty of Dentistry | Annual Research Report 06/07

# **UROP** – Faculty Research Day Winning Group

Project Title:	Accuracy of Lateral Cephalometric Tracing		
	Performed by Dental Undergraduates and		
	Postgraduates as compared to the Gold Standard		
Group Members:	Chay Pui Ling (Miss),		
	Chen Weimin, Evelyn (Miss)		
	Teow Wan Wah (Miss)		
Supervisors:	A/P Kelvin Foong and A/P Keng Siong Beng		

The winning group represented the Faculty at the Dentsply Student Clinician Programme during the SEAADE-IADR meeting.

#### Abstract

Introduction: Lateral Cephalometry is an important diagnostic tool that helps in the formulation of an appropriate treatment plan for the orthodontic patient. The majority of research has been focused on hard tissue landmark identification while less emphasis placed on soft tissue profile analysis. However, the evaluation of soft tissue profile of a patient is an important component of orthodontic diagnosis and treatment planning.

Objective: The project aims to assess the accuracy of soft tissue tracing of lateral cephalometric radiographs by third year undergraduate and postgraduate orthodontic residents using a computer based assessment method.

Methods: A programme for training students in tracing the soft and hard tissue outlines of anatomical structures from lateral cephalograms has been developed between Dentistry and Engineering, NUS.

Thirty-one third year undergraduate dental students and seven postgraduate orthodontic residents performed soft tissue tracings of 10 different lateral cephalograms on the tablet using a stylus. The tracings were compared against the gold-standard tracings done by an experienced orthodontist. Discrepancies between the student and gold-standard tracings were computed as numerical percentage error.

**Results & Conclusion:** Results show that the postgraduates consistently produce more accurate soft tissue tracings as compared to the undergraduates. Contrast and operator fatigue can affect the accuracy of soft tissue tracings.

# **MDS Project**



Student:

Thesis Title: A Comparative Frictional and Surface Roughness Study of a Prototype Fiber-Reinforced Polymer Composite Archwire Dr. Chng Chai Kiat Supervisors: A/P Kelvin Foong Prof Chew Chong Lin

#### Abstract

Clinical Relevance: Patients currently have the option of ceramic brackets if they chose to undergo orthodontic treatment but are concerned about aesthetics. However, though the brackets may be less visible, the non-aesthetic metal wires used in orthodontic treatment affect the aesthetic effect. The development of resin type wires appears to hold the key to solving this problem.

Objectives: Fiber-reinforced polymer composite (FRPC) archwires provide a good aesthetic solution to conventional orthodontic archwires. A prospective study was done with the aim to-

- 1. Compare sliding friction from a prototype FRPC archwire with Nickel-titanium archwire using various bracket-archwire combinations using the Instron Universal testing machine.
- 2. Determine the effects of frictional wear on the surface of the archwires with various bracket and archwire combinations.
- 3. Determine the correlation between surface roughness and friction of the archwires.

Methods: Four different brackets (Gemini, ICE, Clarity and SmartClip) in combination with the FRPC wires and NiTi wires were studied for friction of the archwires with simulated wear and surface roughness.

A three-part study was conducted using an Instron Universal testing machine, a scanning electron microscope, and an atomic force microscope. Analysis of frictional wear generated and surface roughness between the various archwire and bracket groups was done using one-way ANOVA to determine statistical difference at the 5% level.

Least Significant Difference multiple comparisons was used to determine the archwire-bracket group which was statistically significant if significant difference was detected with the one-way ANOVA.

Results: There was no statistical significance difference in frictional wear generated between the different archwire-bracket combination groups. Statistically significant difference was found for surface roughness between the different archwire-bracket combination groups. No statistical difference was found intra-group for all archwire-bracket combinations for both the frictional wear and surface roughness study. No correlation could be determined between frictional wear and surface roughness of the various archwire-bracket combinations in this study.

Conclusion: FRPC wire generally shows comparable frictional wear and surface roughness when studied using the Instron and Atomic Force Microscope respectively. This shows promise in its application as an aligning archwire for use in orthodontic practice. Further research and refinement in its manufacture would be necessary to fully realise its potential as an esthetic orthodontic archwire.



FRPC wire (A) and NiTi wire (B).









Brackets tested, (A) Gemini, (B) SmartClip, C Clarity, D ICE.



*P.I.:* 

#### **Project Title:** Roles of Chondroitin Sulphate Proteoglycans in Palatal Wound Healing Assoc Prof Foong Weng Chiong, Kelvin Total Project Value: S\$69,500

Major Achievements: Chondroitin sulfate proteoglycans (CSPGs) consists of core proteins with varying numbers of chondroitin sulphate (CS) glycosaminoglycan chains attached. Recent advances in research on the metabolism of CSPGs provide the basis for exciting new research questions. Controlling and directing the synthesis of CS chains to achieve accelerated tissue repair is a practical goal. However, a careful study of the biological function of CS and CSPGs is required before clinical application can be made in wound healing. So far, most of the CS studies have focused on the metabolism of CSPGs. Compared to the extensive data on the function of heparin sulfate proteoglycans (HSPGs), very limited data is available on the exact biological function of CS and CSPGs in mammalian cells, especially in human palatal fibroblasts. Several questions need to be answered, such as 1) Is the expression of CSPGs in palatal tissue regulated during wound healing? 2) What is the effect of CS on palatal fibroblast activities? 3) What are the roles of specific sulfation pattern of CS on palatal fibroblast activities which are related to wound healing?

The main hypothesis is that CS is involved in palatal wound healing and regulate palatal fibroblast behaviour. To support this hypothesis: (a) The expression of CS should change in the in vitro wound model; (b) Inhibition of synthesis of chondroitin or sulfation of chondroitin and addition of extraneous CS should affect palatal fibroblast biological activities.

To examine the above hypotheses, this study included a series of experiments in wound model as follows:

Stage 1: The roles of CS and its sulfate group in human palatal fibroblast adhesion, proliferation, and migration was studied in human palatal culture model by addition of inhibitor of sulfation or extraneous CS;

- Stage 2: The expression of CSPGs, chondroitin sulfate synthases (CHSYs) and chondroitin sulfate sulfotransferases (CHSTs) on human palatal fibroblast were evaluated in an *in vitro* wound model:
- Stage 3: The importance of CS was evaluated by reducing the expression of CHSY1 by RNA interference (RNAi) in human palatal fibroblast culture model: and
- Stage 4: The efficiency of extraneous CS on collagen-fibroblast-gel contraction was studied.

This study included a series of experiments to investigate the biological function of CS and its relationship with palatal wound healing. Stage 1 experiment examined the roles of CS and its sulfate group in human palatal fibroblast adhesion, proliferation, and migration. Inhibition of CS sulfation slowed the wound-closure process in vitro. Both chondroitin-4-sulfate (C-4-S) and chondroitin-6-sulfate (C-6-S) are involved in promoting cell proliferation, an activity that is dependent on the presence of the sulfate group. However, the two CS species have opposite effects on cell adhesion: chondroitin-6-sulfate increases but chondroitin-4-sulfate reduces adhesion.

Stage 2 experiments illustrated that CSPGs, CHSYs and CHSTs had a burst expression at early time after wounding in the in vitro wound model. In the Stage 3 experiment, reducing CS expression by the RNAi technique resulted in inhibition of palatal fibroblast proliferation, adhesion and migration. In addition, fibroblast cells were arrested in G2/M phase. In the Stage 4 experiment, extraneous CS efficiently inhibited contraction of collagen-fibroblast-gels. The results suggest that CS can suppress contractile activity of palatal fibroblasts.

In all, these experiments on in vitro wound models proved that CS and CSPGs are involved in the palatal wound healing; CS affected palatal fibroblast cell adhesion, cell proliferation, cell migration and cell cycle. Extraneous CS inhibited contraction of collagen-fibroblast-gels. These findings provide a biological basis for future application of CS for palatal wound healing. For future clinical application, the following studies are needed to focus on these active molecules and their correct dosage, timing, sequence of administration, single or combination of applications, and efficiency of CS for in vivo wound healing.





Immunohistochemical Profiles of Periodontal Structures following Tooth Replantation after Different Extra-Alveolar Conditions -A Canine Model Assoc Prof Varawan Sae-Lim \$\$90,000

Major Achievements: This project established the immunohistomorphometric assay by modifying after Andreasen's histomorphometric analysis, to assess the percentage immunopositive cell counts and mean extracellular intensity score based on a pre-calibrated visual analog scale of 0 to 3 [Fig. 1]. The specimens were evaluated using a light microscope at x40 and x400 with images projected onto a monitor superimposing with a four 45° angle radii grid. With the center of grid coinciding with the center of the root canal in the labiolingual axis, the three periodontal structures (bone, periodontal ligament and cementum) at the eight intersection points along the root circumference were evaluated [Fig. 2] by two independent prior-calibrated examiners.

The growth factors, TGF- $\beta$ , bFGF, IGF-I and VEGF, within the extraction bone sockets, the interfacing periodontal ligament and the cementum on the root surface of avulsed replanted teeth, during the early phase of healing following tooth replantation were localized and characterized.

These temporal and spatial differential expression profiles observed concertedly implicated their roles in periodontal healing following tooth replantation. Platelet-Derived Growth Factor (PDGF) being a potent chemoattractant for macrophages and neutrophils, and a strong mitogen for fibroblasts was found to be intensely expressed on the more severely damaged root surface signifying the first stage of macrophage cleansing activities in the wound healing process. Basic Fibroblast Growth Factor (bFGF) shown to modulate the proliferation and migration of fibroblasts and angiogenesis at the woundhealing site, was also shown to differentially expressed in cementum, periodontal ligament and alveolar bone socket. The expression profile in the latter appeared to suggest a robust role of alveolar socket in periodontal healing of delayed-replanted teeth. Vascular Endothelial Growth Factor (VEGF) initiates cellular matrix deposition and the vascular formation. With the similar VEGF expression in the alveolar bone for both replantation groups, VEGF seemed to modulate the wound healing in both the immediate and delayed replanted teeth to a similar extent. Insulin Growth Factor-I (IGF-I) activates multiple intracellular signaling pathways fundamental for cell growth and differentiation. High IGF-expression in the project correlated well with the area of injury where demand for cellular repair and regeneration is.

This project provided some insights into the immunoregulatory mechanism in the early phase of periodontal healing following tooth replantation which could complement knowledge gained through genomics/bioinformatics technology in the elucidation of healing process following tooth replantation under adverse extra-oral condition.



#### Fig. 1

Visual analog scale of intensity scores for IGF-I: IS 0 (negative), IS 1(mild), IS 2 (moderate) and IS 3 (intense) for cementum, PDL and bone. Immunohistochemical staining with DAB chromogen, counterstained with haematoxylin. IS – intensity score

Morales MC\*, Sae-Lim V. The expression of insulin growth factor I in periodontal healing following tooth replantation'. Annals, Academy of Medicine Singapore, Vol 33 (Suppl), No. 5, September 2004 Pages S57 – S59. (Reproduced with permission from Academy of Medicine Singapore)

(Extracted from the invited Extended Abstract as one of the top three finalists in the Best Oral Presentation Award – Surgery / Obstetrics & Gynaecology / Dentistry / Ophthalmology (Laboratory Based) – Ethicon Surgical Book Prize (Laboratory) at the 3<sup>rd</sup>National Healthcare Group, Annual Scientific Congress 2004)

#### Fig. 2

#### Immunohistomorphometric analysis





Project Title:Production of Bone Cells from Human<br/>Embryonic Stem Cells:Potential for<br/>Transplantation Therapy and Drug /<br/>Biomaterial ScreeningP.I.:Assoc Prof Cao TongTotal Project Value:\$\$ 671,020

Major Achievements: The objective of this project was to examine the differentiation of human embryonic stem cells (hESC) into the osteogenic lineage using different differentiating factors.

The first step of the project was to optimize in vitro culture and cryopreservation of undifferentiated hESC. Once this was achieved, the project focused on deriving osteoblasts from hESC. At the same time, an attempt was made to study the immunogenicity of osteoblasts derived from mesenchymal stem cells within the rabbit model. Our research on hESC differentiation also diverged into other somatic lineages useful for bone tissue engineering, in particular the chondrogenic and vascular endothelial lineages.

Besides accomplishing our original stated objectives, we have also made significant achievements in other research areas supported by this grant. This is attested by our many peer-reviewed publications, many of which are in high impact scientific journals i.e. Stem cells, Journal of Bone and Mineral Research, Journal of Immunology, Journal of Gene Medicine, Journal of Molecular Medicine and Cardiovascular Research. Indeed, the international scientific community recognizes our contribution to stem cell research, as seen by the fact that the Principal Investigator has been invited numerous times to present the team's findings at various international conferences and seminars. He has also been asked on numerous occasions to peer-review various journal manuscripts and research grant applications.



Major Achievements: The objective of this project was to develop an advanced light-activated-disinfection technique to eradicate biofilm bacteria from root canal systems and dentinal tubules. The Advanced Non Invasive Light Activated Disinfection (ANILAD) offered the potential advantage of significantly eradicating biofilm bacteria in root canal lumen, dentinal tubules and anatomical complexities for endodontic disinfection.

Experiments were conducted to characterize the photophysical, photochemical and photobiological properties of different photosensitization formulations to eliminate gram positive and gram negative bacterial biofilms. A specific photosensitization formulation based on glycerol, ethanol and water was observed to be ideal as a carrier of photosensitizer in root canals. The photosensitization medium and the irradiation medium are used in two stages in this Advanced Non-Invasive Light Activated Disinfection (ANILAD). This technique showed great potential to significantly eliminate bacterial biofilms in root canal. Further, the cytotoxicity of ANILAD was significantly lower than sodium hypochlorite, a commonly employed root canal disinfectant. The experiments conducted in this project, highlighted the potential advantages of using ANILAD for endodontic disinfection.

#### **Patents and Publications:**

- 1. PCT Patent Application No. PCT/SG2006/000154. June 2005.
- George S, Kishen A\*. Advanced Non Invasive Light Activated Disinfection: Assessment of Cytotoxicity on Fibroblast Versus Antimicrobial Activity against Enterococcus faecalis. Journal of Endodontics 2007; 33(5):599-602.
- 3. George S, Kishen A\*. Biophysical Characterization of Photosensitizer in Different Formulations for Improved Light Activated Disinfection in Endodontics. Journal of Biomedical Optics 2007; 12(3):034029.
- George S, Kishen A\*. Influence of Photosensitizer Solvent on the Mechanism of Photoactivated Killing of Enterococcus faecalis. Photochemistry and Photobiology (in press).
- Kishen A.\*, George S, Kumar R. Enterococcus faecalis Mediated Biomineralized Biofilm Formation on Root Canal Dentine. Journal of Biomedical Materials Research: Part A 2006; 77(2); 406-415.



Volumetric Modeling of the Muscles of Mastication in Humans from Magnetic Resonance Imaging Assoc Prof Foong Weng Chiong, Kelvin

Aims: To develop and validate the computer algorithms for accurate automated image segmentation of the masseter, temporalis, lateral and medial pterygoid muscles of mastication from two-dimensional slices of magnetic resonance images.

To create individualized anatomically and spatially accurate three-dimensional volumetric models of the masseter, temporalis, lateral and medial pterygoid muscles from the two-dimensional slices of MR images.

Abstract: This project arose out of a multidisciplinary collaboration between NUS Dentistry, Engineering, Medicine and the Biomedical Imaging Laboratory of A\*STAR in the supervision of an NGS A\*STAR PhD scholar.

This project aims to build three-dimensional volumetric models of the masseter, temporalis and pterygoid muscles of mastication from two-dimensional slices of magnetic resonance images. The anatomic volumetric model of the muscles of mastication will be an improvement over the current physically based facial models employed in facial surgery planning and simulation.

The creation of accurate anatomic models has the potential for developing an immersive and interactive environment for the teaching of gross and surgical anatomy involving the muscles of mastication. In addition, it is possible to quantitatively determine the relationship between masticatory muscle pathology and its effect on mandibular movement. Such an anatomic model is timely and the innovative method to be employed in the creation of the volumetric model has a further potential for realistic facial approximation through accurate computerized volumetric models of the skin and the underlying muscles and jaw bones following facial trauma. Facial approximation is timely with applications in surgical, forensic and archaelogical facial reconstructions.

The volumetric model also would provide a more accurate method of prediction of facial tissues changes following facial orthognathic surgery with the differentiation of muscles of mastication from other soft tissue types following differential data input of how each tissue type respond to strain and stress.

*Clinical Relevance:* The development of a volumetric computer model of the muscles of mastication is a necessary major step in the creation of an individualized volumetric virtual human head with the ability to identify and isolate the major masticatory muscle groups. There is a high likelihood for the volumetric model of masticatory muscles to be developed as a rich educational and clinical resource.



A 2D magnetic resonance image showing the defined outlines for the masseter and lateral pterygoid masticatory muscle groups.



Understanding Bacteria-Substrate Interaction in Endodontics Dr. Anil Kishen Total Project Value: S\$168,795

Aims: To study biomaterial (Type-1 collagen and dentine)-bacteria interaction using a customized optical tweezer system.

To understand the factors that influence bacterial adherence and subsequent biofilm formation on root canal dentine.

Abstract: Bacterial cells can adhere to the surface of a biomaterial, inert device and tissue and form biofilm structures. A biofilm consist of a community of microbes that are adsorbed to a solid surface and are protected by a slimy bacterial secretion. Biofilm structures formed on biomaterial surfaces are resistant to antibiotic therapy and can lead to persistent infections in human beings. These infections are categorized as Biomaterial-centered infection. Persistent apical periodontitis is a common disease condition that is associated with an infected tooth. Survival of bacteria, adherence of bacteria to tissues or biomaterials and development of biofilm are major cause of biomaterial-centered persistent apical periodontitis. Although this is an important issue in clinical dentistry, to date not much investigations has been conducted to understand or treat biomaterial-centered infection. The objective of this project is to study the mechanism of substrate (biomaterial and tissue)-bacterial interaction in root canals. A customized optical tweezer system will be developed to study bacteria-substrate interaction.

Clinical Relevance: These experiments will aid in developing treatment strategies to prevent post-treatment infection in endodontically treated teeth.



Project Title:

P.I.:

Alveolar Ridge Preservation with Polycaprolactone Scaffold Compared to Extraction Alone for Implant Site Development: A Clinical, Radiographic and Histologic Study in Humans Assoc Prof Lim Lum Peng Total Project Value: S\$47,100

Aims: To test the effectiveness of the PCL scaffold in maintaining the physical dimensions of the alveolar ridge after extraction.

Abstract: Research had shown that alveolar ridges tend to lose width and height after extraction of teeth. Such losses can cause problems in the restoration of missing teeth with bridges and implants. Various methods of alveolar ridge augmentation have been advocated, each with its advantages and limitations. With emerging trends in tissue engineering in the medical sciences, this study is designed to assess the potential use of polycaprolactone (PCL) scaffolds for alveolar ridge preservation following extraction of teeth in humans.

20 patients will be divided into 2 groups. In one group, patients will have a PCL scaffold placed into the socket after extraction. In the other group which serves as the control, no scaffold will be placed. Extractions were carried out using an atraumatic technique for both groups. After a healing period of 6 months, changes in the width and height from baseline is measured for both groups. A bone biopsy is also taken at this time from both groups. Hardness of bone, histomorphometric and histologic features, radiographic density of alveolar ridge and mechanical properties of the bone biopsy will be assessed. Preliminary results on 4 cases (2 tests and 2 control) showed uneventful healing. Histological analyses is currently in progress to determine the quality of healing and hard tissue formation before further work is carried out.

*Clinical Relevance:* If the use of PCL scaffold is proved to be feasible in terms of the ability to preserve alveolar bone dimensions following extractions, it would greatly enhance the practice of restorative dentistry in clinical practice.

# Research Collaborations

# **Research Collaborations in Financial Year 2006**

Collaborating Organizations	Year	Department	Region
Universities			
Saratov State University, Russia	2004 - 2007	Restorative Dentistry	International
Center of Oral Biology, Karolinska Institute	2004 - 2006	Oral and Maxillofacial Surgery	International
University of Wisconsin Madison	2004 - 2006	Oral and Maxillofacial Surgery	International
Harvard University	2004 - 2006	Oral and Maxillofacial Surgery	International
University Medical Center Groningen	2005 - 2006	Oral and Maxillofacial Surgery	International
National Taiwan University, Taipei, Taiwan	2006	Preventive Dentistry	International
University of Washington, USA	2006	Restorative Dentistry	International
Nanyang Technological University	2004 - 2006	Restorative Dentistry	Local
Industries			
3M Singapore Pte Ltd	2002 - 2006	Restorative Dentistry	International
Bio-Scaffold	2004 - 2008	Oral and Maxillofacial Surgery	Local
Research Institutes			
Genomic Institute of Singapore, A*STAR	2004 - 2006	Oral and Maxillofacial Surgery	Local
SIMTech Pte Ltd, A*STAR	2004 - 2006	Oral and Maxillofacial Surgery	Local
Tissue Modulation Laboratory	2007 - 2009	Preventive Dentistry	Local

# **Research Awards and Prizes in FY 2006/07**

No.	Contributor (s) (Staff / Student)	Name of Award	Awarding Agency	International or Local / Regional Award	Details
1	A/P Stephen Hsu, Dr. Gao Xiaoli, Prof David Koh, A/P H. Brian Hwarng, A/P Teresa Loh, Dr. Xu Yunjie, Calvin	IADR Lion Dental Research Award for Junior Investigator	International Association for Dental Research (IADR)	International	Oral presentation on "Development and Validation of Caries Risk Assessment Models for Children", at the 85 <sup>th</sup> Annual Meeting of the IADR, March 2007, New Orleans, USA.
2	A/P Kelvin Foong, Ng Hsiao Piau, Wieslaw Nowinski	Certificate of Achievement by the Pattern Recognition and Machine Intelligance Association (PREMIA)	18 <sup>th</sup> International Conference on Pattern Recognition	International	An article entitled "Automatic Segmentation of Muscles of Mastication from Magnetic Resonance Images using Prior Knowledge" was presented.
3	A/P Stephen Hsu, A/P Thorsten Wohland, Nyi Lay Maung	Hatton/Unilever Travel Award	84th General Session & Exhibition of the IADR 1st Meeting of the Pan-Asian Pacific Federation	International	A poster on "Role of Organic Matrix in Laser- induced Retardation of Enamel Diffusion" was presented.
4	A/P Cao Tong, Dr. Liu Hua	Research Centre for Allergy and Immunology (RCAI) 1 <sup>st</sup> International Summer Programme Award	RCAI International Summer Programme Organizing Committee	Regional	The award comprised of lectureship and poster presentation from 4 to 8 September 2006, in Yokohoma, Japan. The lecture course presented both basic concepts as well as state-of-the-art research that would aid in the understanding of allergy and immunology.
5	A/P Stephen Hsu, Dr. Gao Xiaoli,	Complimentary Award	South East Asia Association for Dental Education (SEAADE) GC Prevention Programme Competition 2006	Regional	An article entitled "Acid Neutralizing Capacity of Foods of Plaque pH after Coca Cola Consumption" was presented.
6	Dr. Ge Zigang	Singapore Millennium Foundation Postdoctoral Fellowship (SMF PDF)	Singapore Millennium Foundation	Local	The award ceremony was held on 25 August 2006 at the Raffles Hotel.

# Editorial Board Memberships in AY 2006/07

No.	Name of Staff	Name of Journal	Position Held	Journal Tier
1	Prof Chew Chong Lin	Journal of Dentistry	Editorial Board Member	Premium
2	Prof Toshio Deguchi	American Journal of Orthodontics & Dentofacial Orthopedics The Angle Orthodontist	Editorial Review Board	Premium
3	A/P Kelvin Foong	Singapore Dental Journal	Section Editor	Reputable
4	A/P Hien Chi Ngo	Journal of Dentistry Oral Health & Preventive Dentistry	Editorial Board Member Editorial Board Member	Premium Others
5	A/P Keng Siong Beng	Singapore Dental Journal	Editorial Reviewer	Reputable
6	Dr. Anil Kishen	Singapore Dental Journal Optics & Lasers in Engineering Journal of Applied Oral Science Open Dentistry Journal	Section Editor Editorial Board Member Editorial Board Member Editorial Board Member	Reputable Leading Others Others
7	A/P Lim Lum Peng	Singapore Dental Journal Hong Kong Dental Journal Oral Health & Preventive Dentistry	Editorial Reviewer Editorial Adviser Editorial Board Member	Reputable Others Others
8	Prof Loh Hong Sai	Singapore Dental Journal	Section Editor	Reputable
9	A/P Jennifer Neo	Journal of Dentistry Journal of Operative Dentistry Quintessence International	Editorial Board Member Editorial Board Member Editorial Board Member	Premium Premium Leading
10	A/P Grace Ong	European Journal of Dental Education	Editorial Board Member	Leading
11	A/P Varawan Sae-Lim	Dental Traumatology Journal of Endodontics Journal of Periodontology Singapore Dental Journal	Editorial Board Member Editorial Board - Scientific Advisory Panel Editorial Reviewer Editorial Reviewer	Premium Premium Premium Reputable
12	A/P Keson Tan	Journal of Oral Rehabilitation Singapore Dental Journal	Editorial Board Member Editorial Reviewer	Leading Reputable
13	Dr. Joanne Uy	Singapore Dental Journal	Editorial Reviewer	Reputable
14	A/P Yeo Jin Fei	Singapore Dental Journal	Editorial Reviewer	Reputable

### Enrolment of Research Students



# New and On-going Research Projects



FS SC No. of Students 

AY 2001/02 AY 2002/03 AY 2003/04 AY 2004/05 AY 2005/06 AY 2006/07 Academic Year

**Research Funding** 



# **Research Students by Nationality**

Faculty of Dentistry | Annual Research Report 06/07



**Conference Papers** 



# **Research Internships**

The Faculty of Dentistry has received numerous students from various schools, both locally and internationally as research interns. These schools include Junior Colleges, Polytechnics, and overseas Universities. The duration of the internship varies from a few months to about a year. The internship can either be full-time or part-time.

These students received guidance from the academic staff members of the Faculty, by learning and working under a specific research project of the staff member.



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