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For the year ahead, the Faculty will continue to aspire and persevere to achieve breakthroughs in our oral health research programme.

A significant milestone for the Faculty of Dentistry was reached in July 2004 when its research arm moved into new research laboratory premises. As a first in its 75 years of history, the Faculty now has dedicated space for oral health research housed in one location. This development affirms the important and substantive role oral health research plays in the Life Sciences research endeavours of NUS and Singapore. Located and occupying half the floor space with an area of 425 sq metres at level 3 in the Defence Science Organization (DSO) building, dental researchers and staff can call this new state-of-the-art research laboratory "home", where they will be able to fully realise the potential of the new facilities to cultivate research skills and make a positive contribution towards oral health care through mission-driven research.

The research directions taken by the Faculty in the context of Life Sciences have resulted in the strengthening of key research focus areas. Research in these focus areas of Regenerative Biology, Cariology/Dentine Research using Biophotonics, Biomaterials, Oro-facial Pain, and Craniofacial Imaging and other developing areas such as Oral Microbiology and systemic issues in periodontal health research have matured steadily over the past twelve months. In the competitive landscape of research funding, faculty staff have continued to secure research funds within NUS and at the national level.

Higher-degree students involved in research contribute substantively to the research endeavours of the Faculty. The emphasis on PhD research training in Dentistry is a conscious move in line with NUS' direction to produce quality researchers. There are currently 20 full-time research scholars and 3 part-time research candidates of whom 10 are on the PhD track. In the Master of Dental Surgery (MDS) programme, every clinical resident conducts meaningful research and completes a research thesis in partial fulfillment of the MDS degree. The appointment of Research Thesis Committees to ensure scientific rigour of the MDS Theses is an important development in the MDS programme to nurture future researchers from our clinical residents.

Despite the limitations in Faculty strength, meaningful collaborative partnerships with colleagues from the NUS Life Sciences faculties and other local and internationally renowned institutions have contributed to the Faculty’s growing impact in research. The Faculty highly values these collaborations which are vital for breaking new ground in oral health research.

The infrastructure is now in place for the Faculty of Dentistry to make a stronger impact in niche areas both locally and globally in oral health research. For the year ahead, the Faculty will continue to aspire and persevere to achieve breakthroughs in our oral health research programme.

Assoc Prof Kelvin Foong
Vice-Dean (Research)
The Faculty of Dentistry conducts mission-driven research in five key areas to improve oral and craniofacial health, and the delivery of care. Research in each of the five key areas of:
(i) Tissue Engineering and Regenerative Biology
(ii) Mechanisms of Oro-facial Pain
(iii) Biomaterials and Biomechanics
(iv) Cariology/Dentine Research using Biophotonics
(v) Craniofacial Imaging and Simulation are driven by teams comprising Faculty staff and students in close collaborative partnerships with colleagues from other NUS Life Sciences faculties such as Engineering, Medicine, Science and Computing. The Faculty’s research endeavors in periodontal oral microbiology and systemic relationships of periodontal disease are progressively emerging as important research directions contributing to the improvement of oral health.

5 Key Mission-Driven Research Areas in the Faculty of Dentistry

- Tissue Engineering and Regenerative Biology
- Mechanisms of Oro-Facial Pain
- Biomaterials and Biomechanics
- Cariology Research/Biophotonics
- Craniofacial Imaging and Simulation

The infrastructure is now in place for the Faculty of Dentistry to make a stronger impact in niche areas both locally and globally in oral health research.
Research Highlights

Laser-induced Prevention Of Enamel Erosion Caused By Acidic Soft Drinks
Ms Y.C. Ng, Ms S. Veerasamy, Mr H.C. Sng, Mr C.K. Wee, Ms H.C. Zheng, Assoc Prof S.B. Keng, Assoc Prof C.S. Hsu

In the last few decades, global consumption of acidic soft drinks and prevalence of enamel erosion have significantly increased especially in developed countries. Lasers have also demonstrated preventive effects on enamel demineralisation.

**Objective:**
To evaluate the laser-induced reduction of enamel demineralisation caused by an acidic soft drink in an in-situ model.

**Methods:**
Four non-carious premolars were selected and lased with Er:YAG laser (VSP, 40MJ, 3Hz, 3s, 2940nm) with fine-water spray. Enamel sections of each tooth were varnished except the natural surfaces, before being placed in palatal plates. Three subjects wore the plates containing four sections each and one subject wore one with eight sections for 12 hours every night for 28 days. The subjects with different caries risk profiles rinsed with 50ml of CocaCola® (pH=3) for five minutes, four times a day. Stereoscopy and Polarised Light Microscopy were used to quantify the change in lesion depth. The Wilcoxon signed rank test with a 95% confidence level was used for statistical analysis.

**Results:**
There is a significant difference (p<0.001) between the change in lesion depths in the lased sections (101.18µm) and the corresponding non-lased sections (252.50µm).

**Conclusion:**
The Er:YAG laser treatment may have a preventive effect on enamel erosion caused by frequent use of acidic soft drinks. This project was supported by grants from Academic Research Fund, Ministry of Education, Singapore.

Novel PCL-based Scaffolds As Delivery Systems For Periodontal Tissue Engineering
Ms Bina Rai, Prof Teoh Swee Hin, Prof Hutmacher Dietmar, Dr Cao Tong, Assoc Prof Ho Kee Hai

A prerequisite for placing dental implants is that sufficient amount of bone must be available to fully cover the implant and for the implant to support a fixed prosthetic restoration. The long-term goal of our study is to accelerate bone regeneration of the defect, specifically the reconstitution of lost alveolar bone, tooth root cementum and periodontal ligament to improve the long-term prognosis of the implant. We hypothesise that a bone tissue engineering strategy that adopts bioactive three-dimensional polycaprolactone (PCL) scaffolds in combination with fibrin tissue sealant and growth factors could suffice as the ideal bone regenerative device. We base this proposition on preliminary data obtained as described:

(1) The Effect of rhBMP-2 on Osteoblasts Seeded onto 3D Bioactive PCL Scaffolds
Our group evaluated the influence of varied concentrations (0, 10, 100 and 1000 ng/ml) of human recombinant bone morphogenetic protein-2 (rhBMP-2) on the osteogenic expression of canine osteoblasts, seeded onto poly-caprolactone 20% tricalcium phosphate (PCL-TCP) 3D scaffolds in-vitro. Biochemical assay revealed that groups with rhBMP-2 displayed an initial burst in cell growth that was not dose-dependent. However, after 13 days, cell growth declined to a value similar to control. Significantly less cell growth was observed for construct with 1000ng/ml of...
rhBMP-2 from 20 days onwards. Confocal microscopy confirmed viability of osteoblasts and at day 20, groups seeded with rhBMP-2 displayed heightened cell death as compared to control. Phase contrast and scanning electron microscopy (SEM) revealed that osteoblasts heavily colonised surfaces, rods and pores of the PCL-TCP scaffolds (Fig. 1). This was consistent for all groups. Finally, Von Kossa and osteocalcin assays showed that cells from all groups maintained their osteogenic phenotype throughout the experiment. Calcification was observed as early as four days after stimulation for groups seeded with rhBMP-2. Thus, rhBMP-2 seems to enhance the differentiated function of canine osteoblasts in a non-dose dependent manner. This resulted in accelerated mineralisation, followed by death of osteoblasts as they underwent terminal differentiation. Notably, PCL-TCP scaffolds seeded only with osteoblasts sustained excellent osteogenic expression in-vitro.

(2) Novel PCL-based Honeycomb Scaffolds as Drug Delivery Systems (DDS) for rhBMP-2

The specific aim of the second study was to investigate the suitability of PCL-based scaffolds in combination with fibrin sealant as DDS for rhBMP-2 at the concentrations of 10 and 20 _g/ml for a period of 21 days. PCL and PCL-TCP-fibrin composites displayed a loading efficiency of 70 and 43% respectively, independent of rhBMP-2 dosage. Confocal and SEM revealed sparse clumps of rhBMP-2 particles, non-uniformly distributed on the surface of PCL-fibrin composites. In contrast, individual rhBMP-2 particles were evident and uniformly distributed on the rods of the PCL-TCP-fibrin composites. PCL-fibrin composites loaded with 10 and 20 _g/ml rhBMP-2 demonstrated a tri-phasic release profile as quantified by an enzyme-linked immunosorbent assay (Fig.2). This consisted of burst releases at 2 h, days 7 and 16. A bi-phasic release profile was observed for PCL-TCP-fibrin composites loaded with 10 _g/ml rhBMP-2, consisting of burst releases at 2 h and day 14. PCL-TCP fibrin composites loaded with 20 _g/ml rhBMP-2 showed a tri-phasic release profile, consisting of burst releases at 2 h, days 10 and 21. Hence, the addition of TCP caused a delay in rhBMP-2 elution. Sodium-dodecyl sulphate polyacrylamide gel electrophoresis and alkaline phosphatase assay verified the stability and bioactivity of eluted rhBMP-2 at all time points.


Comparison Of Problem-based Learning Versus Traditional Lecture

Dr Soh Jen, Assoc Prof Lim Lum Peng, Dr Chng Hui Kheng, Dr Betty Mok, Dr Hilary Thean, Dr Victor Ho, Assoc Prof Kelvin Foong

Problem-based learning (PBL) has been introduced as an approach to learning since 1996. While earlier reports by Faculty members have indicated that PBL is useful and well-received by students, no studies have been conducted to compare the learning outcomes of PBL as compared with traditional learning. A pilot project was carried out amongst third year dental students to compare the effectiveness between problem-based learning (PBL) and traditional lecture (TL) method on the learning outcomes. The class was divided into 4 groups of which 2 groups (n=16) had PBL while the other two groups (n=16) had TL. The measure of effectiveness of teaching method was assessed based on the test results from multiple-choice questions (MCQ) and short questions (SQ) related to a chosen topic. A total of 4.5 hours of official learning sessions was given for both PBL and TL. The lecturer, PBL facilitators and students had no prior knowledge of the tests that would be conducted at the end of the learning sessions. The MCQ and SQ test results of the PBL and TL groups were compared using Mann Whitney U Test (2-tailed, p< 0.05). There was no significant difference in the MCQ results (P>0.05). However, a significant difference was found in SQ results (p<0.05). Students who had PBL scored better than those who had TL. Students’ self perceptions on the effectiveness of the approach to learning were positive, no differences were found between the PBL and traditional learning group. In conclusion, within the confines of this study, PBL was found to be a more effective teaching method than TL in the learning outcome of dental students. However, factors than the learning approach per se would have contributed to the outcome of the students’ learning experiences.

Preliminary Findings Of Periodontal Health Of Patients With Diabetes

Assoc Prof Lim Lum Peng, Dr Fidelia Tay, Dr Sum Chee Fang, Dr Thai Ah Chuan, Dr Hla Myint Htoon, Dr Tan Wah Ching, Dr Khurram Ataullah

There is an emerging global awareness on the relationship between periodontal disease and systemic health. Of the systemic conditions, diabetes has been ranked as one of the key risk factors associated with destructive periodontal disease; a risk ratio ranging from 2-4 has been reported. Singapore has one of the highest prevalence of diabetes which affects over 9% of the adult population in Singapore. The purpose of this collaborative project is to find out:

- the periodontal health status of diabetic patients from two diabetic centres in Singapore and to correlate the findings with clinical and laboratory markers
- the effectiveness of an intervention programme to improve the periodontal health of a cohort of patients with diabetes
Informed consent were obtained from the patients prior to commencement of study. Preliminary periodontal examination of 110 patients with diabetes shows that over 50% of subjects aged 21-65 presented with probing depths of at least 5mm, a higher prevalence as compared with population based study. Severity of periodontal disease amongst the individuals examined is affected by glycaemic control; those with unacceptable glycaemic control presented with higher plaque and bleeding scores and more sites with deeper pockets. The findings concurred with studies reported by other investigators. Investigations are currently on-going to correlate certain laboratory markers with the clinical parameters as well as the impact of the intervention programme on periodontal health and glycaemic control. The research findings are likely to yield useful information and provide guidelines for health promotion strategies relevant to improving the periodontal health of diabetic patients in Singapore.

Photo-modulation Of Micro-diffusion In Human Enamel

Ms Deng Yin, Assoc Prof G K Chuah, Assoc Prof C S Hsu

Micro-diffusion in human enamel has been a mystery with little information available even with the help of the modern sophisticated technologies. Many oral diseases and clinical issues have been related to this less-known phenomenon. In the past few decades, laser-induced caries prevention has been well documented; however, the mechanisms remain unclear. The surprising results of our previous studies have given rise to an innovative "organic blocking theory", elucidating the statistically significant effect of organic matrix (OM) in the laser-induced caries prevention. The aim of this particular study was to further investigate the role of organic matters in the laser-induced porosity changes. The human enamel samples were characterised by thermogravimetric analysis (TGA) and N₂ physico-adsorption. TGA results confirmed that our NaClO treatment had removed a sizeable portion of the OM in the enamel sample. The surface area and pore volume of normal enamel powder decreased significantly after Er:YAG laser treatment (as shown in Fig. 1). In contrast, in the NaClO-treated enamel powder, the surface area did not significantly decrease (p>0.05) and the pore volume remained almost unchanged. The substantial difference in porosity changes between the control and the experimental groups after laser treatment (as shown in Table) confirmed the importance of OM in the photo-modulation of micro-diffusion channels in enamel. In other words, the photo-thermal and/or photo-chemical effect of Er:YAG laser has modified the micro-diffusion pathway, in particular those intra-prismatic spaces with pore size of 4 nm, and hence impede the demineralisation (tooth decay). In conclusion, the findings in this study have substantiated the 'organic blocking theory' as one of the major mechanisms in the laser-induced caries prevention.

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<th>Sample</th>
<th>Surface area (m²/g)</th>
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<td>Normal enamel powder</td>
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<tr>
<td>NaClO treated enamel powder</td>
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<td>Laser treated enamel powder</td>
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<td>0.020</td>
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<tr>
<td>NaClO &amp; laser treated enamel powder</td>
<td>7.44</td>
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</table>

Table: Surface area and pore volume calculated from the sorption isotherms
Research Highlights

Stem Cell Research
Dr Cao Tong

The makings of future news headlines about tomorrow’s life saving therapies starts in the biomedical research laboratory. Ideas abound; early successes and later failures and knowledge gained from both; the rare lightning bolt of an unexpected breakthrough discovery - this is a glimpse of the behind the scenes action of some of the world’s most acclaimed stem cell scientists’ quest to solve some of the human body’s most challenging mysteries. A new era in stem cell biology began in 1998 with the derivation of cells from human blastocyst and fetal tissue with the unique ability of differentiating into cells of all tissues in the body, i.e., the cells are pluripotent. Since then, several research teams have characterised many of the molecular characteristics of these cells and improved the methods for culturing them. In addition, scientists are just beginning to direct the differentiation of the human pluripotent stem cells and to identify the functional capabilities of the resulting specialised cells. Although in its earliest phases, research with these cells is proving to be important to developing innovative cell replacement strategies to rebuild tissues and restore critical functions of the diseased or damaged human body. To join this cutting edge research in life science front, a team lead by Dr Cao Tong of Faculty of Dentistry is currently working on the osteogenic, chondrogenic (Fig. 1) and cardiomyogenic differentiation from colonies of human embryonic stem cells (Fig. 2, 3). The team has planned and will start the keratinocyte and hepatocyte differentiation.

Collaborations:
- Howard Hughes Medical Institute and President and Fellows of Harvard College, Harvard University
- WiCell Research Institute, University of Wisconsin Madison
- Genome Institute of Singapore
- Faculty of Science, NUS
- Faculty of Medicine, NUS
- Division of Bioengineering, NUS
- Center for Oral Biology, Karolinska Institute

Human Embryonic Stem Cell Lines under Investigation:
- HUES-1, Harvard
- HUES-7, Harvard
- HUES-12, Harvard
- HUES-17, Harvard
- H-9, WiCell

Recent Related Publications:
- Strategies for directing the differentiation of stem cells into the chondrogenic lineage in-vitro. In Press, Stem Cells, 2004 June
- Can RNA interference be used to expand the plasticity of autologous adult stem cells? In Press, J Mol Med. 2004 June
- Scaffold design and in-vitro study of osteochondral co-culture in a three-dimensional porous polycaprolactone scaffold fabricated by fused deposition modeling. Tissue Eng. 2003;9 :S103-12
- Factors influencing stem cell differentiation into the hepatic lineage in-vitro. In Press, J Gastroenterol Hepatol. 2004 August
Research Highlights

- The differentiation status of stem cells and their derivatives - a key consideration in transplantation medicine. In Press, ASAIO J. 2004 July
- Potential utility of cell permeable transcription factors to direct stem cell differentiation. In Press, Stem Cells Devel. 2004 June
- Reprogramming autologous skeletal myoblasts to express cardiomyogenic function. Challenges and possible approaches. In Press, Int J Cardiol. 2004 June
- Possible use of human embryonic stem cell-derived cardiomyocytes to direct autologous adult stem cells into the cardiomyogenic lineage. In Press, Acta Cardiol. 2004 June

Tooth avulsion, the total displacement of a tooth out of its socket, can cause extensive damage to the tooth pulp and the supporting periodontium (PDL). Irreversible damage to the PDL at the tooth/bone interface can lead to ankylosis with bone in direct contact with and gradually replacing the root substance (replacement resorption) Fig 1. This would lead to malocclusion, weakening of the crown support and eventually crown fracture or tooth loss, compromising function and esthetics, notwithstanding psychological impact as well as a financial burden. To date, there are no predictable therapeutic measures to manage the sequelae of replacement resorption. Regeneration of the functional periodontium is the ultimate objective of tooth replantation following avulsion injury.

It is recognised that cellular and molecular events are uniquely coordinated in the wound healing process regulated by the biological mediators/growth factors. Our study investigated the early expression of Insulin Growth Factor-I (IGF-I), implicated in cell proliferation, migration and metabolism, in the periodontal healing following tooth replantation using immunohistomorphometric assay. Our results (Fig. 2 - 5) showed differential temporal expression of IGF-I in cementum, PDL and bone in normal periodontium as well as in the healing periodontium under optimal (immediate tooth replantation) and adverse (delayed tooth replantation) conditions. The expression of IGF-I implicates its role in periodontal healing of replanted teeth. Knowledge of such would allow insights into its contribution and potential to induction of cellular events that may lead to periodontal regeneration of replanted tooth.
**Awards**

- **2003 IADR Pulp Biology Group Student Travelling Award**: Ms Saw Tzuen Yih, Dr Cao Tong, Dr Liu Hua, Assoc Prof Yap Adrian, Assoc Prof Ng Mah Lee. Maintenance of Odontoblasts and Pulp Fibroblasts in Incisor Slice Culture for Pulp-Cytotoxicity Testing of Dental Materials. The 81st International Association for Dental Research General Session and 2nd Meeting of the Pan European Federation, Goteborg, Sweden, 24th - 28th June 2003.

- **Assoc Prof Stephen Hsu** was the winner of the "Finalist Award-for Excellence in Research Enhancing the Specialty of Pediatric Dentistry", conferred by the American Association for Pediatric Dentistry, June 2003.

- **Ms Tan Kai Soo**, (PhD candidate), Research Assistant, Department of Preventive Dentistry, supervised by Dr Keang Peng Song and **Assoc Prof Grace Ong**, won the **First Prize** of the 18th South-East Asian Division International Association for Dental Research Travel Award in Vietnam, September 2003 for the project entitled "Cytotoxic-distending Toxin of Actinobacillus Actinomycetemcomitans - A Self-splicing Intron"; to represent the South-East Asian Division at the International Hatton Competition at 82nd International Association for Dental Research, General Session in Honolulu, Hawaii, USA in March 2004.

- **Dr Salikin Zulfikri** (MDS Orthodontics resident), supervised by **Assoc Prof Kelvin Foong**, was the recipient of **Craniofacial Biology Award** at the International Association for Dental Research South-East Asian Division meeting in Vietnam, September 2003 for his research project entitled "A Non-contact Surface Laser Scanning Technique - A 3D Validation Study".

- **Assoc Prof Ho Kee Hai** won the **Best Poster Presentation Award** at the Asia-Pacific 2004 Conference on Dental Implant held in Melbourne in March 2004 for his research project entitled "Regeneration of Bone Using a Bioresorbable 3D Scaffold-Osteoblast Project". The other collaborators are Ms Bina Rai, Mr Kamal bin Yacob, Dr Cao Tong and Prof Teoh Swee Hin.

- **Assoc Prof Stephen Hsu** and Dr Veerappan Girija clinched the **Best Oral Science Poster Merit Award** at the 7th National University of Singapore-National University Hospital Annual Scientific Meeting in Singapore for his poster "Synergistic Effect of Er:YAG Laser and Fluoride on Inhibition of Caries Formation in Enamel" on 3rd October 2003.

- **Dr Zou Xiaohui**, whose poster entitled 'The Effect of Heparan Sulfate and Chondroitin Sulfate On Palatal Fibroblast Activities' (supervised by **Assoc Prof Kelvin Foong**), co-supervised by Dr Cao Tong and Dr George Yip) won the **Best Oral Science Poster Award** at the 7th National University of Singapore-National University Hospital Annual Scientific Meeting in Singapore.

- **Ms Bina Rai** was awarded **Best Paper Award (Postgraduate Category)** for her paper on "The Effect of rhBMP-2 on Canine Osteoblasts Seeded Onto 3D Bioactive Polycaprolactone Scaffolds" at the 3rd Scientific Meeting of the Biomedical Engineering Society (Singapore) on 21st May 2004. The co-authors are Assoc Prof Ho Kee Hai, Prof Teoh Swee Hin, Dr Cao Tong, Dr Dietmar W. Hutmacher, Mr Kamal bin Yacob and Dr Chen Fulin.

**Patents**

- **Prof Chew Chong Lin** and his research team (Dr Loh Poey Ling, Assoc Prof Seeram Ramakrishna, Dr Ganesh Vijay Kumar and Assoc Prof Teoh Swee Hin) filed a Singapore patent on "Fibre-reinforced Composite Dental Post with Graded Stiffness". Patent ID No: P-No 79227 dated 27th February 2004.

- **Dr Chng Hui Kheng** and her research team (Dr Tong Yen Wah and Assoc Prof Adrian Yap) filed a US Provisional patent on "Viscosity Enhanced Root Repair Material" on 24th October 2003.


**Editorial Appointments**

**Prof Chew Chong Lin**  
Editorial Board, Journal of Dentistry

**Prof Loh Hong Sai**  
Section Editor, Oral Medicine, Oral Pathology, Oral Surgery  
Section Editor (Oral & Maxillofacial Surgery), Singapore Dental Journal

**Assoc Prof Adrian Yap**  
Editorial Board, Operative Dentistry  
Chief in Editor, Singapore Dental Journal  
Editorial Board, American Journal of Dentistry

**Assoc Prof Grace Ong**  
Editorial Board, European Journal of Dental Education

**Assoc Prof Ho Kee Hai**  
Editorial Board, Asian Journal of Oral and Maxillofacial Surgery

**Assoc Prof Jennifer Neo**  
Editorial Board, Operative Dentistry  
Editorial Board, Asian Journal of Aesthetic Dentistry

**Assoc Prof Kelvin Foong**  
Section Editor (Preventive Dentistry), Singapore Dental Journal

**Assoc Prof Keson Tan**  
Editorial Board, Journal of Oral Rehabilitation

**Assoc Prof Lim Lum Peng**  
Editorial Board, Singapore Dental Journal  
Editorial Board, Oral Health & Preventive Dentistry

**Assoc Prof Stephen Hsu**  
Science Advisory Board, Life Science Web Portals

**Assoc Prof Yeo Jin Fei**  
Guest Editor, Annals, Academy of Medicine Singapore  
Editorial Board, Singapore Dental Journal

**Dr Anil Kishen**  
Section Editor (International Publications), Singapore Dental Journal

**Dr Rashid Tahir**  
Associate Editor, Singapore Dental Journal

**Dr Varawan Sae-Lim**  
Editorial Board, Journal of Dental Traumatology  
Scientific Advisory Panel of Editorial Board, Journal of Endodontics
## Collaborations with other Universities

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## Collaborations with Industry

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## Collaborations with Research Institutions

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<td>Assoc Prof Kelvin Foong</td>
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<td>Preventive Dentistry</td>
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<td>International</td>
<td>CNRS-Medical Imaging Inst (TIMC), France</td>
<td>Assoc Prof Kelvin Foong</td>
<td>Preventive Dentistry</td>
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</table>
PLA2 (crotoxin B or purified human that external application of Group IIA 
trisphosphate (Farooqui et al. 2000). diacylglycerol, and inositol-1,4,5-
arachidonic acid, eicosanoids, platelet-
of second messengers such as 
and D. This activation results in generation 
of central nervous changes in trigeminal neuralgia, but thus 
the knowledge gained from the study would 
possible use of some of the developed 
the clinical management of trigeminal neuralgia.
Production of User-centric Intelligent 
Clinical Support System for 
Temporomandibular Disorders and 
Other Chronic Pain Conditions 
Principal Investigator: Assoc Prof Adrian Yap 
Amount: $70,000
Aims:
• To conduct user-centered analysis over 
the existing user interface and current 
usage patterns of NUS TMDv1.1 and 
identify new usability requirements. 
• To establish a multi-lingual and multi-
platform system enabling system usage 
across the world.
• To develop a user-centric design for 
the user interface. This includes 
replacing the current text-based 
interface with a more intelligent 
graphical interface that will simplify 
both data entry and review.
• To conduct domain analysis to identify 
treatment types and decision models 
for their application.
• To re-architect existing NUS TMDv1.1 
application (including user defined field 
generation) and information architecture 
to include a module for patient tracking 
and prognosis, and a rule-base that 
defines the rules for diagnosis.

Chronic facial pain is a multi-disciplinary 
problem. Amongst the four recognisable orofacial chronic pain complexes 
(Temporomandibular disorders [TMD], 
Atypical Facial Pain, Atypical Odontalgia 
and Oral Dyssaesethaesthesia, TMD is the most prevalent. TMD refers to a collection of 
medical and dental conditions affecting 
the temporomandibular joints and/or the 
muscles of mastication, as well as 
tissue changes. The total number of people experiencing TMD-related pain is estimated at more than 10 
people in America alone. Concerns 
regarding the welfare of TMD sufferers 
as well as safety and efficacy of TMD 
care have prompted NIDCR (National 
Institutes of Health, USA) to target TMD 
as one of its high priority research areas 
for 2003.

A critical obstacle to the further understanding of TMD is the lack of 
standardised diagnostic criteria for defining 
subtypes of TMD. The Research 
Diagnostic Criteria for TMD (RDC/TMD) 
was established by Dworkin & co-workers 
(1992) to address this lack. RDC/TMD 
allows for the standardisation and 
replication of research into the most 
forms of muscle and joint-related 
TMD. Its dual axis approach also allows 
physical diagnosis to be coordinated with 
operationalised assessment of pain-related 
behaviors, psychological distress and 
psychosocial function associated with 
TMD and other chronic pain conditions.
RDC/TMD is usually administered by pen 
and paper. The data collected are then 
entered manually and batch processed 
by a mainframe computer. A time lag 
between patient history taking/ 
examination and the generation of 
diagnosis is thus inevitable. A project to
create an on-line diagnostic tool based on the RDC/TMD was undertaken by NUS. This computerised diagnostic system (NUS TMDv1.1) allowed for direct data input by patients/clinicians, chairside generation of Axis I and II findings, and automatic archiving of data is SPSS or other tab-delineated formats for data mining and global exchange.

A trial program involving 17 international centers in American, Europe, Asia and Australia was conducted. Preliminary findings of this program and the future evolution of RDC/TMD, warrants the development of the next generation of multi-lingual, clinician centered support system with intelligent multimedia interfaces and patient prognosis/treatment tracking engines.

**Clinical Relevance:**
Tool developed will help facilitate global research in TMD leading to better understanding of the disorder, its associated risk factors and progression.

**Production of Bone Cells from Embryonic Stem Cells for Transplantation Therapy and Drug/Biomaterial Screening**

**Principal Investigator:** Dr Cao Tong
**Amount:** $671,020

**Aims:**
To explore the possibility of stimulating and directing differentiation of human embryonic stem cells (hESCs) toward bone cells.

Undifferentiated and immortal pluripotent cells are an ideal source of cells for the study of cell/tissue/organ/body development and gene control, for gene/cell therapy as gene/protein deliverers or repairing cells, for the development of toxicity screening tests of biomaterials and drugs, and for cell/tissue/organ transplantation therapy. To serve this promise, human embryonic stem (ES) cells have been developed. By manipulating the culture conditions under which ES cells differentiate, it has been possible to control and restrict the differentiation pathways of the cell types within the embryoid body and thereby generate cultures enriched for lineage-specific precursors. Using this approach, some animal and human ES cells have been used to generate a range of distinct phenotypes including hematopoietic precursors, neural cells, adipocytes, muscle cells, and chondrocytes. Based on the technology we have developed of differentiating human adult stem (AS) cells toward osteogenic cells, this project explores the possibility of stimulating and directing differentiation of human ES cells toward osteogenic cell lineages, with the final hope of producing new bone cells for transplantation therapy for various bone diseases and drug/biomaterial screening.

**Clinical Relevance:**
Bone cells from hESCs are ideal unlimited source of human bone cells for (1) the study of development and gene disorder of bone diseases, (2) for gene/cell therapy as gene/protein deliverers or repairing cells for bone diseases, (3) for the development of safety/biocompatibility screening tests of bone related biomaterials and drugs, as well as (4) for cell/tissue/organ transplantation therapy for bone regeneration and reconstruction.

**Oral Health Attitudes and Periodontal Disease Risk Profile of Adult Diabetics in Singapore**

**Principal Investigator:** Assoc Prof Lim Lum Peng
**Amount:** $168,065

**Aims:**
• To implement an oral health promotion programme for adult diabetics and to evaluate the short term effects of the programme in terms of patients’ compliance with oral hygiene recommendations and improvement of periodontal health.

It has been well documented that patients with diabetes are more susceptible to destructive periodontal disease. A pilot study conducted amongst adult patients with diabetes indicated a high prevalence of destructive periodontal disease in the local population. In view of the high prevalence of diabetes in the adult population in Singapore, there is a need to address the periodontal health problem of this category of patients. To understand the problem better, information is required on the oral health attitudes, the profile of the disease in terms of the biological process associated with tissue destruction and periodontal healing mechanisms. The aim of this study is to investigate the periodontal disease profiles and oral health attitudes of adult patients with diabetes using clinical and laboratory markers as well as Questionnaire data. Adult patients from two Diabetic centres will be recruited for the study. Informed consent will be obtained from patients prior to commencement of project. 30 Adult patients attending periodontal treatment will serve as controls. Full mouth oral/periodontal assessment and oral hygiene education will be given. Blood and salivary samples will be obtained. A questionnaire will be administered to assess the oral health attitudes and practices of the participants. Subjects will be evaluated using similar assessment criteria at the end of 6 months. The data will be entered into SPSS Software. For the data analysis, individuals will be categorised into groups according to the level of glycaemic control. Between groups comparison will be analysed for periodontal health status, biochemical markers and compliance with oral health practices using parametric and non-parametric tests.
Clinical Relevance:
The research could have significant implications in the management of diabetic patients at a community level in the following areas:

- Periodontal disease risk assessment of diabetic patients.
- Achieve a better understanding of the biological processes associated with periodontal healing and tissue destruction in diabetics with potential future development of strategies targeting at improving periodontal healing responses of diabetics.
- Establish effective oral health promotion and intervention programmes for diabetics through a better understanding of the general and oral health attitudes of diabetics.

Advanced Non Invasive Light Therapy to Eradicate Bacteria Flora in Dentine
Principal Investigator: Dr Anil Kishen
Amount: $146,250

Aims:
- To examine the effectiveness of a non-invasive low-level light based approach to eradicate bacterial flora in dentine.
- To evaluate various structural changes induced in dentine by pathology and endodontic therapy.
- To examine the effectiveness of a non-invasive low-level light based approach to eradicate bacterial flora in dentine.

Clinical Relevance:
This research will pave the way for an advanced non-invasive light based therapy for effective disinfection of the root canal systems.

An Assessment of Orthodontic Treatment Need and Demand in Chinese Adolescents
Principal Investigator: Dr Soh Jen
Amount: $66,705

Aims:
- To determine the objective need for orthodontic treatment in Singapore Chinese adolescents as assessed by an orthodontic clinician.
- To establish the extent to which dentofacial attractiveness has in determining the subjective patient demand and objective clinician-derived need for treatment in the same adolescents.
- To determine the level of parental awareness of malocclusion, orthodontic treatment and perception of dentofacial attractiveness in the context of treatment demand.

Clinical Relevance:
Orthodontic treatment need and demand appraisal has implications on treatment uptake and the availability of resources for the delivery of quality care.

The perception of malocclusion by adolescents and parents can help clinicians better understand the level of concerns, satisfaction and emphasis given to dental aesthetics.
New Research Project funded by Biomedical Research Council

Innovative Non-Invasive Laser Treatment for Prevention of Enamel Demineralisation (Tooth Decay)
Principal Investigator: Assoc Prof Stephen Hsu
Amount: $799,450

Aims:
• Characterisation of heat-induced physicochemical changes in enamel HA crystals.
• Computational modeling of laser-induced heat flow and the subsequent transient three-dimensional profile of the temperature rise in enamel.

Despite the significant decline of caries rate in the last few decades in the developed countries, dental caries is still reported to be the single most common chronic childhood disease (Report of US Surgeon General, 2000). In Asia, more than 80% caries rate has been reported in many epidemiological studies (Stephen, 1993). Since 1960’s, accumulated evidence has clearly demonstrated the laser-induced caries prevention (LICP) in enamel. However, many clinicians are still concerned about a potential pulpal damage caused by the high-energy laser irradiation used in melting and/or sealing the enamel as advocated by the highly regarded "enamel melting hypothesis" in the last few decades. By avoiding enamel melting, a multidisciplinary research team has recently succeeded in using low energy laser to provide significant caries prevention in enamel and quantified two major mechanisms, "crystal purification" and "organic blocking", in LICP (Hsu et al., 2000). Although this breakthrough may precipitate the clinical development of LICP, the laser parameters capable of maximising these two mechanisms remain unknown. The purpose of this study is to comprehensively characterise the laser-enamel interaction and subsequently identify the optimal laser parameters for LICP. The program will first qualitatively and quantitatively characterise the physicochemical properties of heated enamel at consecutive temperature ranges. The second step is to build a computational model to simulate the four dimensional profiles of laser-induced heat flow and temperature rise in enamel. Both CO2 and Er:YAG lasers will be used to investigate the overall benefit-damage ratio from the correlated optical-thermal-mechanical-chemical-crystallographic perspectives. The simulation model will be systemically validated and refined based on these experimental data and subsequently used to select the optimal range of laser parameters to maximise the LICP. As a result, this study may pave the road for the development of an innovative non-invasive laser device for caries prevention.

Clinical Relevance:
This project, if aims achieved, will bring in new therapies for preventing decays in human teeth.

New Research Project funded by National Medical Research Council

Prospective Study of Periodontal Disease Risk Markers and Treatment Outcome of a Periodontal Programme for Adult Diabetics in Singapore
Principal Investigator: Assoc Prof Lim Lum Peng
Amount: $114,125

Aims:
• To Investigate the effects of simple periodontal treatment like oral hygiene and scaling on periodontal health in a cohort of patients with diabetes in Singapore.
• To investigate the influence of behavioural factors on periodontal treatment outcomes in diabetics.
• To correlate the treatment outcome with metabolic control and periodontal disease risk markers.

Diabetes has been recognised as one of the key systemic risk factors in destructive periodontal disease. While it is generally accepted that patients with poor glycaemic control have poorer periodontal health, there is no consistent agreement as to whether improved periodontal health would help to improve glycaemic control. It has been well established that simple periodontal therapy like scaling and oral hygiene can be effective in controlling periodontal disease. However, few studies have been conducted in patients with diabetes. In view of the high susceptibility to periodontal disease in diabetic patients, early diagnosis and management are likely to improve the periodontal health of this group of patients. The aim of this study is to investigate the effects of an intervention programme on the periodontal health status of adult diabetics attending treatment at two diabetic centers in Singapore. Informed consent would be obtained prior to commencement of study. All subjects would receive full mouth periodontal assessment and will be randomly allocated into three groups: Oral hygiene and Scaling, Oral hygiene education and a control. Blood and saliva samples will also be collected. Subjects will be evaluated at 3 months and 9 months. Questionnaire will be administered at the different time points to explore factors which may influence oral health behaviour of the individuals. The outcome to the intervention programme will be determined using the following clinical parameters: Plaque, Bleeding on probing, probing depths. The biological responses will be evaluated by analysis of blood and saliva samples for the common inflammatory markers. Change in attitude and behaviour will be evaluated through questionnaire.

Clinical Relevance:
The research could have significant implications in recommendation of appropriate treatment strategies in the management of periodontal disease as an integral component of diabetic care. The study would provide useful information in the following areas:
• Effects of non-surgical periodontal treatment on gingival responses in patients with diabetes.
• Identify biological and behavioural factors affecting healing responses of patients with diabetes following periodontal therapy.
Refereed Publications

Calendar Year 2003

Premium

Cao, T., K.H. Ho and S.H. Teoh
Scaffold Design and in-vitro Study of Osteochondral Co-culture in a 3D Porous Polycaprolactone Scaffold Fabricated by Fused Deposition Modeling.


Mechanism of Strength Increase for a Hydrothermal Porcelain.


Griggs, J.A., J.C. Wataha and A. Kishen


Ho, C.H., A. Khoo, R. Tan, J. Teh, K.C. Lim and V. Sae-Lim
pH Changes in Root Dentin Following Intra-canal Placement of Improved Calcium Hydroxide Containing Gutta Percha Points.


Design and Development of a New Composite Orthodontic Archwire.


Lim, T.S., T.Y. Wee, M.Y. Choi, W.C. Koh and V. Sae-Lim


Ma, K.M. and V. Sae Lim
The Effect of Topical Minocycline on Replacement Resorption of Replanted Monkeys’ Teeth.

Dental Traumatol. 2003 Apr;19(2):96-102. (United States)

Ng, V.A.C., D.S.Q. Koh, B.Y.Y. Mok, S.E. Chia and L.P. Lim
Salivary Biomarkers Associated with Academic Assessment Stress Among Dental Undergraduates.


Quek, S.L. and K.C. Lim
Pattern of Third Molar Impaction in a Singapore Chinese Population: A Retrospective Radiographic Survey.


Rohner, D., S.M. Chung, D.W. Hutmacher and K.T. Tsai
Bone Response to Unloaded Titanium Implants in the Fibula, Iliac Crest, and Scapula: An Animal Study in the Yorkshire Pig.


Soh, M.S., A.U.J. Yap and K.S. Siow
Effectiveness of Composite Cure Associated with Different Curing Modes of LED Lights.


Soh, M.S., A.U.J. Yap and K.S. Siow
Effectiveness of Cure of LED Curing Lights at Varying Cavity Depths.


Actinomyces spp. in Supragingival Plaque of Ethnic Chinese Preschool Children with and Without Active Dental Caries.


Wattanapayungkul P . and A.U.J. Yap
Effects on In-office Bleaching Products on Surface Finish of Tooth-colored Restoratives.


Effect of Mouth Rinses on Microhardness and Wear of Composite and Compomer Restoratives.

Effect of Food-simulating Liquids on Shear Punch Strength of Composite and Polyacid-modified Composite Restorative.  

Yap, A.U.J., K.S. Siow and M.S. Soh  
Thermal Emission by Different Light-curing Units.  

Effect of Surface Treatment and Cement Maturation on Dentin Bond Strength of Resin-modified Glass Ionomers.  

Yap, A.U.J., P. Wattanapayungkul and S.M. Chung  
The Polymerisation Process on Composite Resistance to Chemical Degradation by Food-simulating Liquids.  

Yap, A.U.J., N.Y. Wong and K.S. Siow  
Composite Cure and Shrinkage Associated with Very High Intensity Curing Light.  

Microwave Drying of High Strength Dental Stone: Effects on Dimensional Accuracy.  

Effects of Finishing/Polishing Techniques on Microleakage of Resin-modified Glass Ionomer Cement Restorations.  

Effects of Instrumentation Time on Microleakage of Resin-modified Glass Ionomer Cements.  

Veerappan, Girija and C.S. Hsu  

Kishen, A., M.S. John, C.S. Lim and A. Asundi  
Development and Application of a Fiber Optic Biosensor to Monitor Mutans Streptococci Activity in Human Saliva.  
Biosensors & Bioelectronics 2003; Oct 18 (11), 1371-1378. (United States).

Kishen, A., V.M. Murukeshan, V. Krishnakumar, C.S. Lim and A. Asundi  
Digital Speckle Pattern Interferometry and Thermographic Analysis on the Thermal Response of Human Teeth.  

The Biological, Social and Psychological Relationship Between Depression and Chronic Pain.  
Annals, Academy of Medicine, Singapore, S50-51, 32 (2003). (Singapore).

Ong, K.S. and S.B. Keng  
Osteogenic Role of Vascular Endothelia Growth Factor in Bone Regeneration.  

Yap, A.U.J., P.H.N. Cheang and P.L. Chay  
Mechanical Properties of Two Restorative Reinforced Glass Ionomer Cements.  
Prevalence of TMD Subtypes, Psychological Distress and Psychosocial Dysfunction in Asian Patients.

Marginal Gap Formation of Composites in Dentin: Effect of Water Storage.

Yap, A.U.J. and S.H. Teoh
Comparison of Flexural Properties of Composite Restoratives Using the ISO and Mini-flexural Tests.

Ataullah, K. and L.P. Lim
Power-driven Scalers for Periodontal Instrumentation - A Review.
Singapore Dental Journal 2003; 25(1): 75-81. (Singapore)

Chng, H.K.
Root Canal Therapy: Single-visit or Multiple-visit Approach?

Lim, L.P.
Periodontal Health Status of the Singapore Population.

Preejith, P.V., C.S. Lim, A. Kishen, M.S. John and A. Asundi
A Fiber Optic Evanescent Wave Based Biosensor for Total Protein Detection.

Soh, J. and A. Sandham
Factors Influencing Orthodontic Treatment Uptake.

Thean, H.P.Y. and M.L. Wong
Removable Prostodontics and the Non-institutionalised Chinese Elderly in Singapore.

Ong, K.S. and S.B. Keng
Evaluation of Surgical Procedures for Trigeminal Neuralgia.
Preventive Effect of Er:YAG Laser on Demineralisation by Coke in Human Enamel: A Pilot Study.
7th National University of Singapore-National University Hospital Annual Scientific Meeting - New Frontiers in Medicine, 2nd - 3rd October 2003, National University of Singapore, Singapore.

Ng, V.A.C., D.S.Q. Koh, B.Y.Y. Mok, S. Choo and L.P. Lim
Salivary Biomarkers Associated with Academic Examination.

Ng, V.A.C., D.S.Q. Koh, B.Y.Y. Mok, Q. Fu, L.P. Lim and S.E. Chia
Stress and Stressors Among Dental Undergraduates over the Course of the Academic Year.

Quek, C.E.Y., K.B.C. Tan and J.I. Nicholls

Quek, V.K.L., S.B. Keng, K.W.C. Foong and S.H. Ong
Validation of 3D Analysis of Edentulous Arch Shapes and Contours.
18th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 25th - 27th September 2003, Ho Chi Minh City, Vietnam.

Nanoindentation Study of Human Premolars Subjected to Bleaching.
World Congress on Medical Physics and Biomedical Engineering, 24th - 29th August 2003, Sydney, Australia.

Ramakrishna, S., K. Fujihara and V.K. Ganesh
Dental & Orthopaedic Applications of Polymer Fibrous Composites.
8th Japan International SAMPE Symposium & Exhibition, 18th - 21st November 2003, Tokyo Bigsight, Tokyo, Japan.

Sadique, S.E., S. Ramakrishna and V.K. Ganesh
4th International Conference on Biological Mechanisms of Tooth Movement and Craniofacial Adaptation, 18th - 21st August 2003, USA.

Soh, M.S. and A.U.J. Yap
Post-gel Polymerisation Shrinkage of “Low-shrinkage” Composite Resins.
81st General Session of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Soh, J. and M.T. Chew
Comparative Assessment of Facial Profile Aesthetics by Professionals, Dental Students and Laypersons.
103rd Annual Session American Association of Orthodontists, 2nd - 6th May 2003, Hawaiian Islands, USA.

Tan, K.S., K.P. Song and G.H.L. Ong
Transcript Analysis of the Leukotoxin Operon in Highly and Minimally Leukotoxic Strains of Actinobacillus Actinomycetemcomitans.
81st General Session and Exhibition of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Veerappan, G. and C.S. Hsu
The Effects of CO₂ Laser Irradiation on Enamel Demineralisation: An In-vitro Study.
7th National University of Singapore-National University Hospital Annual Scientific Meeting - New Frontiers in Medicine, 2nd - 3rd October 2003, National University of Singapore, Singapore.
Conference Papers

Calendar Year 2003

Wattanapayungkul, P., A.U.J. Yap and S.M. Chung
Influence of Curing Lights on Composite Resistance to Chemical Degradation By food-simulating Liquids.
81st General Session of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Yang, M., S.H. Ong and K.W.C. Foong
Three-dimensional Craniofacial Landmark Detection.
World Congress 2003 on Medical Physics and Biomedical Engineering, 24th - 29th August 2003, Sydney, Australia.

Yang, M., S.H. Ong and K.W.C. Foong
Computer-based Detection of Craniofacial Landmarks.
7th National University of Singapore-National University Hospital Annual Scientific Meeting, 2nd - 3rd October 2003, National University of Singapore, Singapore.

Yap, A.U.J.
An Introduction to TMD: The Biopsychosocial Approach.
1st Malaysian Orofacial Disease Study Group - University of Malaya Meeting, 19th - 20th April 2003, Kuala Lumpur, Malaysia.

Yap, A.U.J.
Diagnostic Criteria and Clinical Examination for TMD.
1st Malaysian Orofacial Disease Study Group - University of Malaya Meeting, 19th - 20th April 2003, Kuala Lumpur, Malaysia.

Yap, A.U.J.
Management of TMD.
1st Malaysian Orofacial Disease Study Group - University of Malaya Meeting, 19th - 20th April 2003, Kuala Lumpur, Malaysia.

Yap, A.U.J.
TMD for the General Dental Practitioner.

Yap, A.U.J.
Understanding and Enjoying Research.
South Zone Science and Technology Centre STA (Science and Technology Centre) Symposium 2003, 8th January 2003, Singapore.

Yap, A.U.J., E K Chua and K.B.C. Tan
Depression and Somatisation: Influence on Self-report of Pain and Disability.
81st General Session of the International Association for Dental Research, 25th - 28th June 2003, Goteborg, Sweden.

Yeo, J.F.
The Evidence Base of Dental Implantology.

Zhao, B., S.H. Ong and K.W.C. Foong
Registration of 2D Cephalometrics to 3D Facial Shape.
7th National University of Singapore-National University Hospital Annual Scientific Meeting, 2nd - 3rd October 2003, National University of Singapore, Singapore.

Expression and Functionality of Heparan Sulfate on Soft Palatal Wound Healing.
1st - 5th September 2003, Stuttgart, Germany.

Expression and Function of Chondroitin Sulfate on Palatal Wound Healing.

The Effect of Heparan Sulfate and Chondroitin Sulfate on Palatal Fibroblast Activities.
18th International Association for Dental Research (South-East Asian Division) Annual Scientific Meeting, 25th - 27th September 2003, Ho Chi Minh City, Vietnam.

Yeo, J.F.
Applying Evidence-based Medicine in the Dental Practice.
Endodontics

Year 3
Dr Goh Kwee Chien, Benny
The Early Expression Profile of Platelet Derived Growth Factor in a Tooth Replantation Model
Supervised by
Dr Varawan Sae-Lim

Dr Maria Cristina F. Morales
The Expression of Insulin-like Growth Factor-1 in Periodontal-like Healing of Replanted Teeth
Supervised by
Dr Varawan Sae-Lim

Year 2
Dr Ang Ee Choon, Richard
Analysis of VEGF Expression in Immediate and Delayed Replanted Teeth
Supervised by
Dr Varawan Sae-Lim

Dr Kuah Hong Guan
The Effects of Chelating Agents on Smear Layer Removal With and Without Ultrasonics at the Apical 1/3 of the Root Canal: A SEM Study
Supervised by
Dr Patrick Tseng

Dr Lee Chee Wee
PDLF/Tooth Co-culture
Supervised by
Dr Varawan Sae-Lim

Prosthodontics

Year 3
Dr Lee Kong Fei, Frank
Critical Bending Moment of Four Fixture-Abutment Interface Designs
Supervised by
Assoc Prof Keson Tan
Prof Jack Nicholls

Dr Ng Hsu Ching, Lynette
Fatigue Loading of Selected Post and Core Systems
Supervised by
Prof Chew Chong Lin

Dr Quek Heng Chuan
Load Fatigue Performance of Four Fixture-abutments Interface Designs
Supervised by
Assoc Prof Keson Tan
Prof Jack Nicholls

Dr Uy Joanne Ngo
Load Fatigue Performance of Full Gold Crowns Cemented with Resin Cements
Supervised by
Assoc Prof Jennifer Neo
Assoc Prof Keson Tan

Year 2
Dr Leong Woei Jian, Elvin
The Effect of Tooth Preparation Height and Taper on the Resistance Form
Supervised by
Assoc Prof Keson Tan
Dr Chua Ee Kiam
Dr Wong Keng Mun

Dr Mirza Rustum Baig
Evaluation of Marginal Fit of Cerec 3 OR Other Contemporary CAD/CAM All Ceramic Full Coverage Crowns
Supervised by
Assoc Prof Keson Tan

Oral and Maxillofacial Surgery

Year 3
Dr Hur Wei Tieng
Patched Mutation Detection in Archival Paraffin Embedded Specimens
Supervised by
Assoc Prof Yeo Jin Fei
Assoc Prof Raymond Peck
Dr Winston Tan

Dr Tan Ben Poon, Danny
A Retrospective Study to Determine The Clinical Usefulness of The Osstell System In Predicting Implant Treatment Outcome
Supervised by
Assoc Prof Yeo Jin Fei
Assoc Prof Raymond Peck
Dr Winston Tan Kwong Shen

Dr Yong Loong Tee
A Quantitative Study of VEGF Expression in Membranous and Endochondral Bone Grafts
Supervised by
Assoc Prof Yeo Jin Fei
Assoc Prof Raymond Peck
Dr Goh Bee Tin

Year 2
Dr Lai Juen Bin
The Effects of Locally Injected Steroid on Palatal Wound Healing
Supervised by
Dr Goh Bee Tin

Dr Ng Chee Hon
Requirement of Cox-2 Inhibitor and Surgical Difficulty of Wisdom Teeth Operation
Supervised by
Dr Myra Elliott
Assoc Prof Yeo Jin Fei
Graduate Students Research Projects

Academic Year 2003 - 2004

Graduate Residents in MDS Programmes

Dr Seah Tian Ee
Effects of Chemical Injury on the Inferior Alveolar Nerve of the Rat
Supervised by Dr Andrew Tay

Year 1
Chew Shen Hui, Bertrand
A Double Blind, Randomized, Clinical Trial to Compare the Efficacy of an Alcohol-based Mouthwash, Peridex with an Alcohol-free Mouthwash, Trihexid, on Dental Plaque Accumulation, Gingival Health, and Healing After Wisdom Tooth Surgery
Supervised by Assoc Prof Yeo Jin Fei Dr Sylvia Tay

Dr Deepthy A Nair
Neurosensoryst Disturbance Following Orthognathic Surgery - A Clinical Audit
Supervised by Assoc Prof Yeo Jin Fei

Orthodontics

Year 3
Dr Lim Janee
Bone Regeneration Using VEGF with VICRYL as Scaffold
Supervised by Dr Chay Siew Han Dr Cao Tong

Dr Lo Tong Soon
Bone Regeneration Using VEGF with PCL as Scaffold
Supervised by Dr Chay Siew Han Dr Cao Tong

Dr Salikin Zulfikri
A Non-contact Surface Laser Scanner - A 3D Validation Study
Supervised by Assoc Prof Kelvin Foong

Dr Vic-Pearly Wong
3D Analysis of Mandibular Asymmetry
Supervised by Assoc Prof Kelvin Foong

Year 2
Dr Mok Tong Bee
A Cephalometric Study of Cranial Bases in Chinese Adults
Supervised by Dr Mimi Yow Dr Chew Ming Tak

Dr Poon Kee Hoon
Evaluate the Effectiveness of Mandibular Advancement Device on Chinese Patients with Obstructive Sleep Apnoea
Supervised by Dr Chay Siew Han

Dr Poon Kee Hwang
Cephalometric Dimensions of the Width of the Anterior Alveolus in Chinese
Supervised by Assoc Prof Kelvin Foong

Dr Tang Sin Yee Anna
3D Analysis of Orthodontic Tooth Movement with First and Second Premolar Extractions
Supervised by Assoc Prof Kelvin Foong

Periodontics

Year 2
Dr Khurram Ataullah
Effect of Non-surgical Periodontal Therapy on High Sensitive CRP in Patients with Diabetes
Supervised by Assoc Prof Lim Lum Peng

Dr Tan Wah Ching
Effects of Simple Periodontal Therapy on Periodontal Disease and Glycaemic Control in Patients with Diabetes
Supervised by Assoc Prof Lim Lum Peng

Year 1
Dr Chee Hoe Kit
Longitudinal Evaluation of Periodontal Healing Response in Patients with Diabetes
Supervised by Assoc Prof Lim Lum Peng

Dr Tan Ching Ching
Periodontal Research in Patients with Diabetes
Supervised by Assoc Prof Lim Lum Peng
Graduate Students Research Projects

Academic Year 2003 - 2004

PhD and MSc Candidates

PhD

Assoc Prof Kelvin Foong
Early Palatal Shape Changes in Complete Unilateral Cleft Lip and Palate Following Primary Lip Surgery

Supervised by
Prof Andrew Sandham

Dr Hla Myint Htoon
Oral Health Promotion Programme for Diabetics in Singapore

Supervised by
Assoc Prof Lim Lum Peng

Dr Khoo Suan Phaik
Racial Differences in Clinical TMD Subtypes, Psychological Distress and Psychosocial Dysfunction in an Urban Malaysian TMD Population

Supervised by
Assoc Prof Adrian Yap
Dr Chan Yiong Huak

Dr Li Zhimei
Optimisation for PDLF/AO Double Construct

Supervised by
Assoc Prof Lim Tit Meng
Dr Varawan Sae-Lim
Dr Dietmar W. Hutmacher

Dr Wang Xiaoyan
Environmental Effects on the Physico-Mechanical Properties of Glass Ionomer Cements

Supervised by
Assoc Prof Adrian Yap

Dr Zou XiaoHui
Proteoglycans and Palatal Wound Healing

Supervised by
Assoc Prof Kelvin Foong
Dr Cao Tong
Dr George Yip

Mr Chung Sew Meng
Development of Micro-mechanics Strategies for Characterisation of Dental Composites

Supervised by
Assoc Prof Adrian Yap
Assoc Prof Tsai Kuo Tsing
Dr Lim Chwee Teck

Ms Gao Xiaoli
Laser Application on Caries Prevention

Supervised by
Assoc Prof Stephen Hsu

Mr Saji George
Advanced Non-invasive Light Therapy to Eradicate Bacterial Flora in Dentine

Supervised by
Dr Anil Kishen

Ms Soh Mui Siang
Synthesis and Characterisation of “Non-shrinking” Nanocomposites for Dental Applications

Supervised by
Assoc Prof Adrian Yap
Dr Alan Sellinger

Dr Sum Chee Peng
Structural and Functional Characterisation of Dentine for Endodontic Retreatment

Supervised by
Dr Anil Kishen

MSc

Dr Abhiram Maddi
The Effect of PRP on Osteointegration of Dental Implant

Supervised by
Assoc Prof Ho Kee Hai

Dr Deng Bin
Finite Element Analysis of Angulated Implant Systems

Supervised by
Assoc Prof Keson Tan
Assoc Prof Liu Gui Rong

Dr Edelmiro De Hoyos Gonzalez
Long-term Caries Inhibitory Effects of Fluoride Releasing Tooth-coloured Restorative Materials

Supervised by
Assoc Prof Adrian Yap
Assoc Prof Stephen Hsu

Dr Faisal Moeen
Effect of Varying Height and Taper on the Fatigue Performance of Full-coverage Tescera ATL Ceromer Crowns

Supervised by
Assoc Prof Jennifer Neo

Dr Intekhab Islam
Marginal Adaptation of Retrograde Filling Materials

Supervised by
Dr Chng Hui Kheng
Assoc Prof Adrian Yap

Dr Joseph Antoniraj Jude Aarthi
Genetic Profile of Regenerated Periodontal Tissue

Supervised by
Dr Varawan Sae-Lim
Dr George Yip
Graduate Students Research Projects

Academic Year 2003 - 2004

PhD and MSc Candidates

Dr Kalaiselvi Kuppusamy
Expression of Basic Fibroblast Growth Factor During Periodontal Healing of Replanted Dog’s Teeth
Supervised by
Dr Varawan Sae-Lim

Dr Li Zhimei
Pulp Responses to Acidic Fibroblast Growth Factor in Monkey
Supervised by
Dr Varawan Sae-Lim

Dr Liu Hua
Allogenic Immunoreaction of Mesenchymal Stem Cell and its Differentiated Osteogenic Lineage
Supervised by
Dr Cao Tong

Dr Meenakshi
Ultra Structural Changes in Arulused Periperal Nerves Involved in Trigeminal Neuralgia
Supervised by
Prof Loh Hong Sai
Assoc Prof Yeo Jin Fei

Dr Nyi Lay Maung
Characterisation of Enamel Diffusion Modulated by Er:YAG Laser
Supervised by
Assoc Prof Stephen Hsu

Dr Shi Zheng
3D Osteogenesis Using Stem Cells and Absorbable Scaffolds
Supervised by
Dr Cao Tong

Dr Swaminathan Sethu
Influence of Underlying Substrate Color on the Esthetics of All-ceramic Crown Restorations
Supervised by
Dr Pranee Wattanapayungkul
Dr Loh Poey Ling

Dr Veerappan Girija
Characterisation of Organic Matrix in Lased Enamel
Supervised by
Assoc Prof Stephen Hsu

Dr Wajiha Habib Zuberi
Oral Facial Pain
Supervised by
Assoc Prof Yeo Jin Fei

Ms Saw Tzuen Yih
Comparison Between Tooth Slice Organ Culture and Established Cell Line Culture Models for Cytotoxicity of Dental Materials
Supervised by
Dr Cao Tong
Assoc Prof Ng Mah Lee, Mary
Assoc Prof Adrian Yap

Ms Soh Mui Siang
Composite Cure and Post-gel Shrinkage with Different (Halogen and LED) Curing Lights
Supervised by
Assoc Prof Adrian Yap
Assoc Prof Siow Kok Siong

Mr Toh Wei Seong
Stimulations and Modulations of Osteogenic Differentiation from Human Embryonic Stem Cells
Supervised by
Dr Cao Tong

Ms Wu Xiaowa
Physical Enhancement of Glass Ionomer Cements
Supervised by
Assoc Prof Adrian Yap
Dr Zeng Kai Yang

Mr Ye Chaopeng
Characterisation of Osteogenic Cells Differentiated from Human Embryonic Stem Cells
Supervised by
Dr Cao Tong
Undergraduate Research Opportunities Programme

Academic Year 2003 - 2004

Effects of Surface Treatment and Materials on Class II Open Sandwich Technique.
Low Gim Hong
Peh Gek Chuan
Seetoh Yoong Liang
Tan Cheng Boon, Alvin

Supervised by:
Dr Pranee Watanapayungkul
Assoc Prof Adrian Yap

Repair Strength of Provisional Materials.
Chew Madeline (Ms)
Chin Shou King
Goh May Yee, Maryelle (Ms)
Koh Chee Keong, Ivan

Supervised by:
Dr Loh Poey Ling
Assoc Prof Adrian Yap

Effect of Food Stimulating Liquids on Tooth-coloured Restorative Materials.
Ashraf Ali
Lim Yow Long
Yang Terh Yiau

Supervised by:
Assoc Prof Adrian Yap
Mr Chung Sew Meng

In Situ Evaluation of Laser Effect on the Prevention of Enamel Demineralisation Using an Intra-oral Model.
Ng Yuk Ching (Ms)
Selvajothi d/o Veerasamany (Ms)
Sng Hong Cheong, Jeffrey
Wee Chun Kheng, Eugene
Zheng Hongyan, Cecilia (Ms)

Supervised by:
Assoc Prof Stephen Hsu
Assoc Prof Keng Siong Beng

Surface Roughness of Conventional, Resin-modified and Highly Viscous Glass Ionomer Cements After Prophylaxis.
Sandra Chelvan (Ms)
Tan Sok Fun, Edelweis (Ms)
Wu Shiling, Serene (Ms)

Supervised by:
Assoc Prof Adrian Yap

Bond Strength of Post and Resin Core.
Almad Bin Hassan
Chia Su Wei (Ms)
Fu Jia Hui (Ms)
Nandabalan Panneerselvam

Supervised by:
Dr Loh Poey Ling

The Effect of Food Simulants on the Bond Strength of Orthodontic Bracket Using Resin Modified Glass Ionomer Cements.
Lim Sze Kheng
Low Hwee Hiang (Ms)
Tong Huei Jinn (Ms)
Wong Liping, Florence (Ms)

Supervised by:
Dr Chay Siew Han
Assoc Prof Adrian Yap

The Effects of Glyde File Prep™ on Radicular Dentine Microhardness.
Chan Feng Yi (Ms)
Lee Swee Keow, Pauline (Ms)
Mak Kean Voon
Ng Cher Hui, Mervyn

Supervised by:
Dr Varawan Sae-Lim
Dr Chng Hui Kheng

Alternative Therapy for Oral Lichen Planus - Herbal Therapy.
Chan Sing Yin (Ms)
Tan Chor Yew, Allan
Tho Loo Yee (Ms)
Wang Meiying (Ms)

Supervised by:
Assoc Prof Yeo Jin Fei