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Participants and Sequence Numbers of Abstracts*

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G-1 **The Role of Basic Science in Clinical Dental Research.** G. EMBERY (Univ. of Wales Dental School, Cardiff, UK)

A number of Dental Schools worldwide have invested in oral biology/basic dental science as a specialist discipline to support teaching and research within the clinical training programmes. The research elements range from biomaterials science, odontogenesis, craniofacial development to physiology, microbiology and anatomy. Such Units allow the development of career structures for essentially, although not exclusively, non-clinical staff with the ability to devote more time to laboratory-based research compared with clinical colleagues. Successful Units have interactive programmes with clinical groups allowing a greater understanding of each others problems and the ability to acquire joint funding from both State, Research Council and industrial sources. Although sharing and exchange of specialist apparatus with Medical Schools is more common, the acquisition of a stand-alone apparatus base is vital to everyday functioning and ability to fulfil postgraduate research obligations. The support of the Dental School is vital to maintain the morale and future vision of basic dental science which has done much to raise the profile of clinical dentistry as an academic discipline. Western societies have active programmes in this area – Eastern Europe and other developing regions less so. Other parts of the worldwide offer a mixture of scenarios, e.g. non-clinical colleagues attached to clinical units. Even amongst Western countries not all have Oral Biology Departments. Clearly there are many structures for involving oral biology and an overview of the successes and difficulties apparent will be presented.

O-1 TEM and STEM/EDX study of an all-in-one adhesive containing pre-reacted glass ionomer fillers. *Tay FR¹; Sano H²; Tagami J³; Hashimoto M²; Moulding KM³; Pashley DH¹ (¹Univ. of Hong Kong, ²Hokkaido Univ., ³Tokyo Medical & Dental, ⁴HKUST, ⁵Medical College of Georgia) Reactmer Bond (Shofu Inc., Kyoto, Japan), is a novel fluoride releasing, tri-curable adhesive that utilizes Pre-Reacted Glass Ionomer (PRG) technology. It utilizes both unreacted, as well as fully-reacted glass ionomer particles (F-PRG) as fillers. This study examined the ultrastructure and elemental composition of resin-dentin interfaces that were treated with this single-step adhesive. Dentin disks prepared from human third molars were abraded with either 600- or 60-grit SiC paper to create smear layers of different thickness. They were bonded using Reactmer Bond and further laminated into disk-pairs. Two strips were prepared from each disk-pair, one of which was completely demineralized. Both undemineralized (U) and demineralized (D) specimens were processed for TEM and examined both stained and unstained. Unstained sections were further coated with carbon for STEM/EDX analysis. Results: Stained "D" sections revealed the presence of a 0.5-0.8 µm thick hybrid layer in the 600-grit specimens. The hybrid layer was reduced in thickness and only partially present in the 60-grit specimens. The overlying resin layer exhibited completely different ultrastructural features in unstained "U" and "D" sections. In "U" sections, the conventional glass ionomer filler was characterized by an electron-dense glass core that was surrounded by a hydrogel layer. The F-PRG filler contained numerous spherical, electron-dense "seeds" within the pre-reacted hydrogel. The predominant elements present were Si, Al, La, F and Ca. In the 600-grit specimens, an inhibition zone could be seen along the partially demineralized dentin surface that contained increased levels of Ca, P and F. In "D" sections, numerous artifactual, electron-dense dendritic deposits, rich in Ca, P and La, were evident within the resin matrix and inside both types of glass fillers. The resin matrix was also phase-separated into filler-free domains. The presence of a fluorine-containing inhibition zone, and the appearance of dendritic deposits after laboratory demineralization suggest that continuous ion exchange is possible within the polymerized resin matrix of Reactmer Bond. This probably accounts for its fluoride releasing and recharging potential.

G-2 **Designing and Implementing Clinical Research in Dentistry.** J. W. Stamm (University of North Carolina, Chapel Hill, NC, USA 27514)

Clinical research plays a more critical role than ever, providing the vital end-stage of the contemporary basic-translational-clinical research process that provides for the advancement of the oral health sciences. In addition, clinical research is central to the formulation of dental public health policy and practice, and is the foundation on which modern evidence-based dental practice is being built. High quality clinical research requires the investigator (1) to know what clinical research is, what its components are, and (2) to know how to use clinical research methods, or simply to know how to do it. Hulley and Cummings (1988) speak of the *anatomy* and the *physiology* of applied clinical research. Clinical research will often involve the application of several theory-laden disciplines (e.g. behavioral science, epidemiology, clinical decision theory, biostatistics), but at its most basic, clinical research links methods of clinical observation or intervention with methods of analysis and interpretation that lead to valid conclusions. This presentation will offer an outline of key components involved in conceptualizing, designing and conducting clinical research in dentistry.

O-2 **Effect of different conditioning protocols on adhesion of a high strength GIC to dentin.** FR Tay¹, *SHY Wei¹, H Ngo², RJ Smales², DH Pashley³ (¹The University of Hong Kong; ²The University of Adelaide, Australia; ³Medical College of Georgia, USA)

This study examined the microtensile bond strength (µTBS) and ultrastructure of ChemFlex (Dentsply De Trey, Konstanz, Germany), a highly viscous restorative glass ionomer cement (GIC), to sound dentin that was conditioned with various techniques. Mesial and distal enamel of extracted, human third molars were removed. Dentin surfaces were abraded with 180-grit SiC paper to create standardized smear layers for placement of the GIC. Three teeth were prepared for each conditioning protocol: [C] - no polyacrylic acid (PAA) treatment (control); II [P] - 10% PAA for 10s, no rinsing; [R] - 10% PAA for 10s, rinsed; [K] - 25% PAA for 25s, rinsed; and [H] - 10% phosphoric acid for 15s, rinsed. A 0.5mm layer of a less viscous GIC mixture was initially used to enable better adaptation to the moist, etched dentin. This was followed by GIC buildups using the recommended liquid-powder ratio. After being stored at 100% humidity for 24h, the teeth were vertically sectioned into 0.9 x 0.9mm beams for µTBS evaluation, using the "non-trimming" technique. Beams stressed to failure were examined with SEM. Additional unstained beams from each group were prepared for TEM examination. Both demineralized and undemineralized specimens were examined. Results of µTBS evaluation: [C] 7.2*1.7 MPa, [P] 14.0*3.7 MPa, [R] 14.0*3.4 MPa, [K] 15.0*2.4 MPa, [H] 15.3*3.2 MPa. Kruskal-Wallis ANOVA and Dunn's multiple comparison tests showed that [C] has a statistically lower µTBS (p<0.05). SEM fractographic analysis revealed exclusive adhesive failures along the surface of dentin in [C]. Apparent adhesive failures in the other groups were actually mixed failures. TEM examination revealed the presence of interaction layers (IL) in all groups. In [C], the IL was restricted to the smear layer. In the other groups, IL of varying thickness could be seen in the intertubular dentin. GIC particles could be seen within dentinal tubules in [K] and [P]. It is concluded that the low µTBS observed in [C] reflects the weakness of the smear layer attachment to dentin. Similar µTBS seen in the other groups suggests that such values represent more of the cohesive strength of GIC under tension, rather than true adhesive strength to dentin.

G-3 **Educational Research in Dentistry.**

MA Boyd* (Faculty of Dentistry, University of British Columbia, Vancouver, BC, CANADA)

Over the years, educational research in dental schools has not received significant attention, recognition, respect or reward. Yet such research can be critical to the efficient and effective academic enterprise of teaching and for the establishment and maintenance of continuing competence of future dental practitioners. Interest and acknowledgement in the last decade or so has brought educational research into a more "respectable" community of research initiatives. Venues for publication of investigations and outcomes has increased. New methodological approaches have spawned renewed efforts of investigation, difficult though they may be. Still new investigators need to be encouraged to undertake the study of important issues related to dental education and its delivery. This paper will explore those issues as well as what should or might be investigated, their potential contribution and how a focus for educational research can be fostered for the good of students, the faculty and the profession.

O-3 **Clinical Evaluation of a Compomer in the Restoration of Class I and II Cavities in Permanent Posterior Teeth: 1-year results** C.G TOH¹, NH ABU-KASIM (Dept of Conservative Dentistry, Faculty of Dentistry, University of Malaya, MALAYSIA)

The clinical performances of a compomer (Dyract AP[®]) in combination with a non-rinse conditioner (K-0100[®]) and self-priming adhesive (K-0107[®]) were compared with a hybrid composite resin (Spectrum TPH[®]) in combination with a 36% phosphoric acid conditioner (DeTrey Conditioner[®]) and self-priming adhesive (K-0107[®]) in a randomized controlled split-mouth model. 23 patients with bilateral occlusal and/or interproximal caries had their teeth restored with Dyract AP in one quadrant and Spectrum TPH in the opposite quadrant by either one of the 2 evaluators. Removal of tooth structure was as dictated by caries and access. All non-carious fissures were sealed with either a compomer pit and fissure sealant (K-0093[®]) for compomer restorations or an opaque resin sealant (DeTont DDS[®]). All enamel and dentin were treated with conditioner prior to application of 1 layer of self-priming adhesive. A total of 42 compomer restorations (12 with fissure sealants and 18 complex) and 35 composite resin restorations (13 with fissure sealants and 15 complex) were evaluated at baseline, 6 months and 1 year using the USPHS criteria for retention, colour match, marginal discoloration and integrity, secondary caries, anatomical form, occlusal and proximal contacts, surface texture and hypersensitivity. Two evaluators compared the epoxy resin casts of the restorations with models of the Leinfelder clinical wear standards. All clinical parameters were rated alpha except for fissure sealant with 2 bravo and 1 charlie for compomer restorations and 1 bravo for composite restoration at 6 months and 1 year. Two Class I restorations (1 Dyract AP and 1 Spectrum TPH) from same patient were rated bravo for marginal integrity and one large Class II compomer restoration was bravo for hypersensitivity. No detectable wear was observed except for 1 compomer and 2 composite restorations that exhibited wear of 25µm. There was no significant difference in all parameters measured between compomer and composite restorations (Fisher's Exact Test p<0.01). The clinical results indicate that compomer (Dyract AP) in combination with a non-rinse conditioner and self-priming adhesive can be used for restoring posterior teeth with good clinical response at 1 year.

This study was supported by DENTSPLY DeTrey, Germany with * materials supplied by the same company.

G-4 **Structure-Function-Property Relationships in the Dentoalveolar Complex.**

C.P. Lin* (School of Dentistry, College of Medicine, National Taiwan University, Taipei, Taiwan, R.O.C.).

The human masticatory apparatus plays a largely biomechanical role in the preparation of food for the final absorption by the alimentary tract. Mastication itself is a complex process which involves the integration of a number of subsystems within or related to the oral cavity, such as the TMJ (temporomandibular joint), the corpus of the mandible, salivary system, soft tissues and the dentoalveolar complex. Within the dentoalveolar complex the dentition *per se* provides the comminuting surfaces for the particulate reduction of food, as well as the medium through which stress trajectories are transferred across the various hard tissues interfaces and into the bony cortices of the mandible and maxilla. Enamel and dentin are optimized for different roles in responding to stress, and what appears to succeed is not enamel and dentin separately but enamel and dentin acting as an integrated biomechanical complex. The periodontium is the supporting attachment of the tooth and consists of cementum, periodontal ligament, alveolar bone (cortical and cancellous bone), and a portion of gingiva. No current hypothesis is close to providing a unitary concept that will explain the roles and the functions of the periodontium. The challenge for the future is to develop a comprehensive biologic, mechanical, and mathematical conceptualization of dentoalveolar complex.

O-4 **Resin Coating: Does it Improve the Internal Adaptation of Composite Resin Inlays? P.R JAYASOORIYA*, P.N PEREIRA¹, T.NIKAJDO, J.TAGAMI.** (Cariology and Operative Dentistry, Tokyo Medical and Dental University, Japan; ¹University of North Carolina)

The aim of the study was to evaluate the ability of a "resin coating" to improve the internal adaptation of composite resin inlays (CRI). Ten Class II MOD cavities with gingival margins located above and below the cemento-enamel junction were prepared in extracted premolars. A "resin coating" consisting of a bonding system (Clearfil SE Bond, Kuraray Co. Japan) and a low viscosity resin composite (Protect Liner F, Kuraray Co.) was applied on half of the prepared teeth according to the manufacturer's instructions while the remaining teeth served as the control. CRI (Estenia, Kuraray Co.) were fabricated by the indirect method and cemented (Panavia F, Kuraray Co.). The teeth were thermal cycled (400, cut in half, polished and observed with confocal laser scanning microscope). The results are expressed as a percentage of gap scores (length of interface with gap formation) relative to enamel and dentin segments of the internal tooth restoration interface. The results were analyzed with one-way ANOVA and Fisher's PLSD test (p< 0.05) Mean ± SD, n=10. The gap scores at the internal dentin-restoration interface for resin coated teeth (7.2 ± 3.5) were significantly less compared to the non coated teeth (85.7 ± 6.7). However, there was no statistically significant difference of gap scores at gingival enamel between coated (0.7 ± 2.3) and non coated teeth (1.3 ± 4.1). The "resin coating" technique has been shown to improve the internal adaptation of CRI in dentin though in enamel it does not provide any additional benefit.

O-5 Polymerization of Composite Resin Using Four Curing Light Sources.
P. SENAWONGSE*, M. OTSUKI, J. TAGAMI
(Department of Cariology and Operative Dentistry, Tokyo Medical and Dental University)

Recently, curing units with different light sources were introduced for clinical use. The aim of this study was to compare polymerization of different shades (A1, A2, A3, A4, UD) of a composite resin (Z250, 3M) by using four curing units with different light sources. Halogen lamp (Candelux, Morita, Japan), LED (Lux-O-Max, Akeda Dental, Denmark), xenon (Arc-light, Air Techniques, USA) and metal halide (experimental, Moritex, Japan) were used. Five specimens were prepared for each group by injecting composite resin into cylindrical acrylic molds. Specimens were then polymerized by either a 40 seconds exposure to Candelux or Lux-O-Max or 10 seconds to Arc-light or the experimental curing unit. Specimens were cross-sectioned into approximately equal halves using a diamond-impregnated disc under copious water supply. The samples were subjected to the Miniload Hardness Tester using a 100 g load for 154 sec at 1 h, 24 h, 7 days and 30 days, and recorded as Knoop Hardness Number (KHN). Three KHN indentations were made on the top and bottom surfaces for 1, 2, 3, 4 and 5 mm thickness of each specimen. Means were then calculated for each group. The specimens were kept in a light-proof container at 37°C during observation periods. Statistical analysis was performed using the factorial experiment, one-way ANOVA and Duncan's Multiple Range post hoc test at $\alpha = 0.05$. The four main variables were shades of composite resin, depth of curing, observation periods and curing units. No significant differences were found at 0 to 3 mm between shades of composite resin for each type of curing units. The interactions of shades of composite resin with KHN were found. The KHN of composite resin declined with increasing depth. The polymerization of composite resin continued after removal of the light source for up to 30 days. Using halogen lamp light source showed higher KHN significantly than using other light sources at 4 to 6 mm. There were no statistical differences among Candelux, Arc-light and the experimental curing unit at 0 to 3 mm. For Lux-O-Max, low KHN were found at 1-hour observation. Therefore, the polymerization increased with times. No statistical differences were found between LED light source and others at 0 to 2 mm after 7 days. From the present study, no significant differences were found among shades of composite resin at 0 to 3 mm and among curing unit at 0 to 2 mm after 7 days. This study suggested that new types of light sources as xenon lamp and halogen lamp adequately polymerized composite resin to a depth of 3 mm in one-fourths the curing time of conventional light-curing unit.

O-9 Factors Associated with tooth wear in Southern Thailand. P. CHUJEDONG*, P. BENJAKUL, D. KERTPHON, U. LEGGAT (Fac. Of Dentistry, Prince of Songkla University, Had Yai, Songkhla, Thailand).

Tooth wear is now becoming more of a problem in dentistry. This is because people are keeping their own teeth longer. Although tooth wear is a natural consequence of aging, the process is regarded as pathological if the teeth become so worn that they no longer function effectively or have a seriously mar appearance. The purpose of this study was to evaluate the possible etiologic factors of tooth wear. The severity of tooth wear, by Tooth Wear Index (TWI) and the charting of redissipating factors of tooth wear were recorded from 505 patients, from the Dental Hospital, Prince of Songkia University. The result showed that in the study sample, age, sex (male TWI=0.20, female TWI=0.16), number of tooth loss, frequency of alcohol, sour fruit and carbonate intake were negative factors concerning tooth wear. Alcohol may induce tooth wear indirectly as it causes irritation at the gastric mucosa. This provokes regurgitation, especially from one who is suffering from alcohol abuse. Moreover, the carbonate may weaken the tooth surface allowing the other wear process more easily. Regarding the tooth position, the first molar showed the greatest degree of wearing (TWI=0.31), while the canine(TWI=0.22) and premolar(TWI=0.21) showed less, respectively. For the tooth surfaces, the occlusal surface showed the greatest tooth wear(TWI=0.59) and the cervical(TWI=0.09), lingual(TWI=0.01) and buccal(TWI=0.01) surfaces showed the least, respectively. So factors found to be associated with tooth wear in Southern Thailand were age, sex, number of tooth loss, frequency of alcohol, sour fruits and carbonate intake.

O-6 Effect of the curing time by using high intensity light on bond strength to dentine
N.KATAHIRA*, N.INAI, J.TAGAMI (Cariology and Operative Dentistry, Dept. of Restorative Sciences, Graduate School, Tokyo Med. & Dent. Univ., Japan).

The aim of the study was to evaluate the effect of the curing time on (1) bond strength to dentin, and (2) degree of conversion (DC) of bonding agents using a high and a conventional intensity light-curing units. Two brands of commercially available dentine bonding systems (Clearfil SE Bond; Kuraray, One-up Bond F; Tokuyama) were employed. Bond strength to dentine for each of the bonding systems and degree of conversion (DC) for One-up Bond F were determined using an experimental high intensity light source (GC) and then comparing with a conventional intensity light curing source (GC Newlight VL2). Concerning about irradiation time, the dentine bonding systems were exposed to the light in five ways. For group 1, VL2 was used as a conventional light curing unit and the irradiation time for the bonding agent and resin composite were 10 and 40 s respectively (10+40 s). An experimental high intensity light source was used in group 2 (1+10 s), group3 (3+10s), group4 (5+10s) and group 5 (10+10 s). DC for the bonding agents of One-up Bond F for group 1,2,3,4 and 5 were 47.3, 41.2, 48.6, 28.5 and 9.2% respectively.

	High intensity light source				
	group 1(10+40s)	group 2(1+10s)	group 3(3+10)	group4(5+10)	group5(10+10)
One-up Bond F	18.7(4.8)	5.6(4.5)	12.0(4.2)	16.9(5.3)	17.3(3.0)
Clearfil SE Bond	21.0(5.3)	11.0(3.7)	18.5(3.5)	19.4(6.4)	20.9(3.9)

Two way ANOVA (P<0.05) revealed no significant differences in the bond strength among groups 1, 4 and 5. These results showed that photo polymerization of bonding agents by an high intensity light source for 5s was sufficient to provide adequate bond strength for the dentine bonding systems in this study.

O-10 Denture usage of non-institutionalised elderly in Singapore
H.P.Y. THEAN and P.L. LOH* (National University of Singapore)

The number of elderly persons in Singapore has increased dramatically in the last ten years and is forecast to increase further over the next thirty years. By the year 2030, the population of over 65 year-olds is expected to almost triple what it is now and pass the one million mark to reach 28% of the total resident population. People are retaining their teeth for longer due to better dental care therefore many elderly people will have some natural teeth remaining although not a complete set.

The aim of this survey was to ascertain the current dental health needs, denture wearing habits of the elderly and their pattern of denture care through a questionnaire survey. This survey was conducted in a housing estate by door-to-door interview. Interviews were conducted by social workers and researchers. A total of 1195 people age between 65-97 years living in high-rise housing were surveyed. The sample was 40% male. 49% of the respondents said that they had broken teeth. 7% felt that they required dentures but had not got them made. 2% were due to economic limitations, 4% felt that it was too troublesome and 1% said they could eat anyway. 74% of the respondents wore dentures and 52% of these denture wearers had worn the same set of dentures for over 10 years. 26% had worn the same set of dentures for over 20 years. 90% of the dentures wearers said that their dentures were satisfactory, and they could laugh, speak, eat and chew comfortably. Generally, people were of the opinion that once they had a complete denture replacement that was all the dental treatment they would need for the rest of their lives. As for denture hygiene practices, 95% brushed their dentures and cleaned them with water and 35% soaked them in denture cleansers as well. The findings from this study indicate that there is a need to create greater awareness of dental and denture health care through dental health education and to provide avenues for the elderly to utilize the existing dental services. (Survey funded by Singapore Action Group for Elders)

O-7 Effect of sintering time and temperature on dental porcelain porosity.
K.C. Cheung* and B.W. Darvell (Dental Materials Science) HKU

Mechanical condensation is normally used to pack the particles of dental porcelain powder together to reduce voids and to remove excess liquid binder before firing. However, vibration causes the porcelain compact to slump and flow and surface detail is lost. Moreover, the effect of vibration on reduction of porosity is limited. The aim of this study was to investigate the effect of two basic conditions of sintering: time and temperature, on the porosity of dental porcelains. Five dental dentine porcelains were tested: 2 aluminous porcelains, Alpha (Vita Zahnfabrik, Bad Säckingen, Germany) and Vitadur-N (Vita); and 3 feldspathic porcelains, Omega (Vita), VMK68 (Vita) and Carmen (Esprident, Ispringen, Germany). Five specimens of each porcelain were fired for sintering times of 30 s; 1, 3, 6 and 30 min; 1, 5, 10, 15 and 20 h for all porcelains; the sintering temperatures ranged from 750°C to 950°C for Carmen and 800°C to 1050°C for the others, all with 50°C increments. A software image analyser was used for the measurement of pore areas which were exposed by grinding and polishing to a 1 µm finish. Five fields were measured on each of 5 specimens per condition. Observations of the shape of the pores as well as of the surface condition and edges integrity of the fired specimens and used to define acceptable sintering condition limits. Minimum porosity was obtained by sintering these dentine porcelains at high temperature and short time. It was concluded that the reduction of porosity of dentine porcelain is much more sensitive to temperature than to time.

O-11 FLUORIDE CONTENT IN COMMONLY CONSUMED FOOD ITEMS IN A HIGH FLUORIDE AREA IN SRI LANKA

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In Sri Lanka endemic fluorosis has been reported especially in the North Central Province. Possible sources of fluorides that may cause dental fluorosis include drinking water, excessive consumption of tea and fluoridated tooth paste. The occurrence of higher dental fluorosis scores in children in Eppawala, Sri Lanka consuming water with varying fluoride levels indicated that therea were other contributory factors for dental fluorosis. Therefore the present study was undertaken to analyse the fluoride levels in samples of food items grown in home gardens and commonly consumed by the residents of Eppawala.

Food items, such as different kinds of leafy vegetables, cereals and pulses including rice grown in their home gardens and drinking water samples were collected from 100 households in Eppawala. The analysis of fluoride was done in triplicate using the ionometer and means were calculated in µg/g of edible portions of food. Most of the leafy vegetables from Eppawala showed significantly higher fluoride values (p< 0.05) when compared with those from Kandy which is considered as an area where fluorosis is not endemic. Commonly consumed leafy vegetables showed highly significant values (p<0.01) when compared with those from Kandy. Brijnjals, cereals and pulses showed similar fluoride values.

From this study it suggests that of the causative factors for endemic fluorosis, in addition to water borne fluorides, are commonly consumed food items with high fluoride content.

O-8 Stress Distribution in Ceramics under Hertzian Indentation
X. D. Dong*, B. W. Darvell & S. H. Lo Dent. Mater. Sci. & Civil Eng. Dept. HKU

Strength is a relatively unreliable measure of a single component material's inherent fracture resistance. Mean strength is of limited predictive value for service performance because the fracture resistance of ceramics is affected by ceramic-cement-dentine (or substrate) structure. Furthermore, the failure mode by load-to-failure in laboratory test is rather different from that observed clinically. The present purpose was to analyse the stress state in ceramics under Hertzian indentation so as to understand the failure mode as well as influential factors in laboratory testing. An axisymmetric Finite element method (FEM) model was created. Applied load was 500 N on a spherical indenter with 3 mm radius. Ceramics with monolithic and bilayer structures were placed on the substrate (E_c = 2-200 GPa). For the ceramic, E_c = 70-200 GPa, corresponding to available commercial products. Perfect interlayer bonding, a rigid indenter in frictionless contact with the ceramic, and isotropic, linear as well as homogeneous components were assumed. Results: (1) with increase of E_c, the Hertzian tensile stress (H) was increased, while the bottom tensile stress (B) was decreased. Moreover, for E_c=200 GPa, B became negative except for E_c= 200 GPa; the H zone was enlarged, while the B zone was diminished when E_c was increased. (2) with increase of thickness of ceramics, both H and B were decreased; the B zone was moved to around the central axis and the H zone was far from the edge of the contact area. In thin ceramics the B zone was away from the central axis and the H zone was near to the edge of the contact area. It is concluded that stress distribution is strongly affected by the substrate modulus of elasticity and ceramic thickness. To imitate the clinically relevant failure mode in laboratory test, it is necessary to take these into account. Supported by Faculty of Dentistry, The University of Hong Kong.

O-12 DENTAL FLUOROSIS AND CARIES EXPERIENCE IN CHILDREN LIVING IN A HIGH FLUORIDE AREA IN SRI LANKA

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A study was conducted to establish the prevalence and severity of dental fluorosis and to investigate its relationship to dental caries. The sample consisted of 222, 12-14 year old children who have been life long residents in a rural area in the dry zone of Sri Lanka where the drinking water contains naturally an above optimal fluoride concentration. Dental fluorosis was assessed using the modified Dean's index and dental caries levels were evaluated using WHO criteria. Drinking water samples of children were analysed for fluoride levels. The results revealed that 97% of the children were affected with dental fluorosis. Three per cent was completely free of dental fluorosis and about 20 per cent had extensive fluorosis (scores of 3 and 4). Fluoride levels in the drinking water samples varied from 0.21-9.8 ppm. Higher fluorosis scores were observed in children drinking water with higher fluoride content. Although the caries experience measured by DMFT was 0.43 in children showing no evidence of fluorosis, it increased up to 1.65 in children showing a fluorosis score of 3. The caries protective effect of fluoride appears to decline as the level of fluorosis increases. Since the high fluoride levels in the drinking water is causing dental fluorosis and bears no beneficial role in the reduction of caries in children with severe fluorosis, methods of defluoridation need to be promoted in these areas.

O-13 Early childhood caries (ECC) among pre-school children in Northern Philippines
K.M.G. CARINO, K. SHINADA, S. ABE, Y. KAWAGUCHI
(Oral Health Promotion, Graduate School, Tokyo Medical & Dental University, Japan)

This study was conducted to obtain baseline epidemiological data on early childhood caries (ECC) among pre-school children in Northern Philippines, towards formulation of specific oral health programs for Filipino pre-school children. The sample consisted of 993 children ages 2-6 years old (mean age 4.7 years) from Baguio City, San Jacinto (Pangasinan) and Bontoc (Mt. Province). ECC was defined in this study as the occurrence of dental caries in any one tooth/ tooth surface. Caries experience was evaluated at the cavitation level following WHO guidelines for oral health surveys. Overall ECC prevalence was 91% (2 y=59%, 3y=85%, 4y=91%, 5 y=94%, 6 y=93%). Average dmft was 9.2 (df=9.0, ml=0.2, fl=0.01) indicating a high rate of unmet treatment needs. Caries experience was very skewed among the children: 19.9% had 1 to 5 df, 29.9% had 6 to 10 df, 26.7% had 11 to 15 df, and 13.5% had 16-20 df. Analysis of rates of carious attack among individual teeth show that maxillary central incisors were highly involved (#51=71%, #61=70%), followed by mandibular molars (#74=67%, #75=67%, #84=66%, #85=66%). There were no statistically significant differences between boys and girls, nor between children from the urban and rural areas (one way ANOVA, p>0.05). Results indicated a high prevalence of ECC among pre-school children in Northern Luzon. Oral health programs emphasizing preventive measures and dental health education are urgently needed.

O-14 Caries control programme for children in China – one year results
ECM LO¹, CH.CHU², HC LIN² (Faculty of Dentistry, The University of Hong Kong,
² Dept. of Preventive Dentistry, Sun Yat-sen University of Medical Sciences, China)

Objective: The purpose of the study is to investigate the effects of a 3.8% silver diamine fluoride solution (Safotide) and a 5% sodium fluoride varnish (Duraphat) in preventing and arresting carious lesions in anterior primary teeth of preschool children in Southern China.
Design: 375 children, aged 2-5 years, with caries in their upper anterior teeth were randomly divided into 5 groups receiving 1) caries excavation and application of Safotide annually; 2) caries excavation and application of Duraphat every 3 months; 3) annual application of Safotide; 4) application of Duraphat every 3 months; and 5) water as control. Status of the six upper anterior teeth were recorded at baseline and follow-up examinations at 6 and 12 months. Caries was diagnosis as present when there was a cavity with detectably soft dentine.
Results:

Treatment group	No. of Children	Baseline ds / child	New caries surface / child	Arrested caries surface / child
1.AgF +excavation	71	4.1 ± 2.4	0.4 ± 0.8	2.4 ± 2.1
2.NaF +excavation	71	4.0 ± 2.7	0.6 ± 1.4	1.2 ± 1.6
3.AgF	70	4.3 ± 2.8	0.5 ± 1.0	1.9 ± 2.4
4.NaF	70	3.9 ± 2.6	0.6 ± 0.9	1.0 ± 2.7
5.Control	71	3.9 ± 2.6	1.0 ± 1.3	0.5 ± 1.0
Significance	N.S.		p<0.05	p<0.001

Conclusion: The one year results support the effectiveness of silver diamine fluoride and sodium fluoride in preventing and arresting carious lesions in anterior primary teeth. This study was financially supported by a CRCG grant from the University of Hong Kong.

O-15 Caries and oral pain status among Malaysian drug addicts. SUJAK SL, ABDUL-KADIR R.*, ROZIAH O. Wilayah Persekutuan Dental Division, Ministry of Health and University of Malaya, Kuala Lumpur, MALAYSIA.

Several studies have shown that oral pain due to dental caries can affect one's quality of life and also how one coped with the problem. A descriptive study to look into the impact of pain due to dental caries was conducted among a group of randomly selected Malaysian drug addicts undergoing rehabilitation programme in 13 rehabilitation centres. Oral examination to determine caries experience and an interview-questionnaire survey on pain status and coping were used as the measurement tools. This paper reports on the findings from 599 subjects who complied to both oral examination and the interview survey. Results from the survey showed that caries was highly prevalent (96%) in the sample examined. The mean DMFT was 8.8 (s.d 6.6), the major proportion being contributed by missing teeth due to caries (4.3 s.d 5.7) and decayed teeth (3.6 s.d 3.6). Of those who had caries, 54.8% said they experienced pain during the last one year. Slightly more than a third (37.5%) stated that the pain was severe. To the question as to how they coped with the pain, the majority (37.8%) answered that they had resorted to self medication, slightly less than 30% decided to seek for dentist's help while another 15.5% decided to leave it alone. It is interesting to note that some 14.9% consulted the physician instead. Subjects were also asked as to how oral pain affect their well being. Findings showed that feeling mentally disturbed (47.9%), unable to sleep (42.4%), unable to eat and drink (41.2%), moody and easily angry (40.2%) and unable to focus on their work (32%) ranked in the top five most common reactions to oral pain. Findings from this study conclude that oral pain such as one derived from dental caries can affect one's quality of life and well being.

O-16 The prevalence and distribution of gingival recession in Thai elderly.
C. HOSANGUAN¹, C. UNGCHUSAK², S. LEELASITHORN², and P. PRASERTSOM² (¹Chulalongkorn Univ., ²Ministry of Public Health, Thailand).

The purpose of this study was to describe the prevalence and distribution of gingival recession in Thai elderly. As part of a longitudinal geriatric oral health study, 453 community dwelling dentate subjects, 51 to 92 years of age, were examined at baseline in 1999. All remaining teeth were measured on four periodontal sites to assess the amount of gingival recession. The percentage of surfaces with recession increased with age from 49.1% in 51-59 year olds to 60.6% in 60+ year olds (p<0.001). Males showed greater levels of recession than females (p<0.001). Regression analysis for the percentage of buccal surfaces with recession showed that recession was associated with age, sex, cervical abrasion, and amount of calculus (R²= 0.142, p<0.001). However, the regression model for the percentage of all surfaces with recession did not find an association between recession and cervical abrasion. Hence, it appears that gingival recession on different locations may involve different processes. This study was supported by TRF grant No. RDG3/09/2541.

O-17 Factors Associated with Pain Experience of Patients after Periodontal Surgery. Koh CG*, Ong MMA, Ong ESM, Tay FBK & Lim LP (National Dental Centre, Singapore)

It is generally perceived that pain is a common occurrence following surgical procedures. There is little data on pain experience following periodontal surgery in the Asian population. The aim of this paper was to explore various factors that may be associated with pain experience following periodontal surgery. 102 subjects aged 15-71 were asked to fill in a report of their pain experience at periodic intervals 1-3 days following periodontal surgery. Pain was assessed according to the Visual Analogue scale (VAS). All subjects were randomly given either Paracetamol 1000mg or Mefenamic Acid 250mg immediately following periodontal surgery as part of a clinical trial. Peak VAS was reported at 6 hours after periodontal surgery. The VAS values subsequently decreased 1, 2 and 3 days following surgery. Factors that were considered were gender, age, type of surgical procedure, number of teeth involved, prescription of antibiotics and time taken for surgery. No significant differences in VAS value were found at the various time periods when analysed by Non-Parametric tests (P>0.05) except for marginal differences. 53 subjects did not require a second dose of analgesic following surgery. Those who required a follow-up dose of analgesic had significantly higher VAS values. In conclusion, the results appear to suggest periodontal surgery is perceived to inflict relatively little post operative pain in over 50% of patients. Gender, complexity of the procedure and prescription of antibiotics were not significantly associated with perceived post-operative pain.

O-18 Comparison of two analgesics in controlling Post Operative Pain following Periodontal Surgery LIM LP*, KOH CG, ONG MMA, ONG ESM & TAY FBK (Faculty of Dentistry, National University of Singapore)

Analgesics have been routinely given to patients following periodontal surgery. The aim of this study is to compare the relative effectiveness of two common analgesics used in controlling post-operative pain. 102 patients aged 15-71 undergoing periodontal surgery participated in the study. Subjects were randomly divided into 2 groups. Immediately following periodontal surgery, one group received 1000mg Paracetamol, another group received 250 mg Mefenamic Acid (Ponstan). Patients were asked to take further doses at 6-8 hourly intervals if necessary. Subjects were requested to record the perceived pain experience as measured by the VAS (Visual Analogue scale) at various time periods following periodontal surgery. Lower VAS values were found in the Mefenamic Acid group as compared with the Paracetamol group after 2 hours, 4 hours and 6 hours post-operatively; at day 2 and day 3. The differences were however not statistically significant when analysed by Mann Whitney U test (P>0.05). When the scores of the individual group were compared separately, while VAS values immediately following surgery were significantly lower than during the subsequent hours for both groups (P<0.05); the discrepancies in VAS levels between the post-operative periods of 2 hours, 4 hours and 6 hours were more marked in the Paracetamol group than the Mefenamic Acid group. In conclusion, while no significant differences in VAS values were found between Paracetamol and Mefenamic Acid at the various time points following surgery, the results appear to indicate Mefenamic Acid may be more effective in reducing post operative pain during the immediate post-operative periods. Due consideration should also be taken to other contributory factors which may explain the pain experience following periodontal surgery

O-19 Protease Activated Receptors in Thrombin Induced Gingival Fibroblasts Activation. J.H. JENG*, M.C. CHANG (School of Dentistry, National Taiwan University and Chang-Gung Institute of Nursing, Taiwan)

Thrombin is a serine protease produced following gingival tissue injury or inflammation. It regulates the functional behavior of neighboring cells via activating the specific protease-activated receptors (PARs). In the present study, thrombin (> 1 U/ml), but not thrombin receptor (PAR-1) agonist peptide (SFLLRN, TRAP, 1-50 µg/ml), stimulated the growth and clustering of cultured human gingival fibroblasts (GF). Growth stimulatory effects of thrombin was inhibited by D-Phe-Pro-Arg-CH₂Cl (PPACK), a serine protease inhibitor. On the contrary, trypsin (> 10 µg/ml), a PAR-2 activator, suppressed the growth of GF. Thrombin (> 0.2 U/ml) and TRAP (10-25 µg/ml), but not trypsin, PGE₂ (0.01-0.5 µg/ml) and BSA (1-80 µg/ml), induced the GF-populated collagen lattice contraction within 30-60 min of exposure. Thrombin-induced collagen lattice contraction was inhibited by PPACK (20 µg/ml) and an actin filament polymerization inhibitor, cytochalasin B (1 µg/ml). TRAP induced collagen lattice contraction was also inhibited by cytochalasin B, but not by PPACK. Concomitantly, thrombin (5 U/ml) induced the c-fos and c-jun mRNA expression of GF within 1 h of exposure, whereas stimulation of c-myc expression occurred 7 h later. Stimulation of c-fos and c-myc mRNA expression by thrombin could be inhibited by PPACK (20 µg/ml). Interestingly, TRAP (50 µg/ml) induced c-fos but not c-myc mRNA expression. Using reverse-transcriptase polymerase chain reaction (RT-PCR), expression of PAR-1 and less PAR-3, but little PAR-2 and PAR-4 in human GF was found. These results indicate that thrombin are important in the periodontal wound healing by promoting the growth and contraction of GF. Differential activation of PARs by thrombin and the subsequent early gene expression are crucial for these biological effects.

O-20 *Jatropha curcas* latex inhibit collagenase release by fibroblast
F. SIREGAR*, SMS AKBAR (Department of Oral Biology, Faculty of Dentistry, University of Indonesia, Jakarta, Indonesia)

Jatropha curcas (Euphorbiaceae) latex, among others is used traditionally for a mouth wash in bleeding gums, to cure toothache, and as an antiinflammatory in trauma. Bleeding gum is a sign of gingivitis or periodontitis where collagenase plays a role in its pathogenesis. The objective of this study was to investigate the effect of latex on the collagenase release by fibroblasts. To this end, human gingival fibroblast cells were cultured in 6-well plates in DMEM-0.1% BSA added by 4 concentrations of latex (37.5 to 300 µg/ml) and 10 ng/ml interleukin-1 beta to activate collagenase production. Following 1 to 4 days of incubation, supernatant was taken and stored at -20°C. Enzyme assay was performed using collagen as a substrate, and the reaction products were separated by SDS-PAGE. After CBB staining, followed by destaining, the 3-4 αA bands, which are characteristic of collagen breakdown, were measured semiquantitatively by Adobe Photo computer program. The results showed that the addition of increasing amounts of *J. curcas* latex narrowed the bands, which were no longer observed at 300 µg/ml latex. It is concluded that *Jatropha curcas* latex inhibited the release of collagenase by fibroblasts. The study was funded by RISBIN-IPTEKDOK and H-J Freisleben. The authors would like to thank The Institute fuer Physiologische Chemie, Johannes Gutenberg Universitaet, Mainz, Germany, for performing the study.

O-21 Caries Risk Assessment of Sjögren Syndrome Patients. M.OTSUKI*, Y.TAKAHASHI, T.YAMADA, H.TODA, J.TAGAMI (Tokyo Medical and Dental University, Tokyo, Japan)

Secretion of saliva is one of the biggest risk factors of dental caries. Patients of Sjögren syndrome often show low secretion of saliva. The purpose of this study was to evaluate the caries risk factors of Sjögren syndrome patients. Sixty patients of Sjögren syndrome were scored DMFT and measured secretion of saliva. They were two males and fifty-eight females and average age was 54 years old. Buffering of saliva, amount of mutans streptococci, lactobacillus and candida albicans were also evaluated using Dentobuff Strip (Orion Diagnostica, Finland) and Dent Cult SM, LB and CA (Orion Diagnostica, Finland) or CRT strip and bacteria (Vivadent, Liechtenstein). Thirty students of School for Oral Hygienists were also assessed caries risk as control. Results were statistically analyzed. For the patients of Sjögren syndrome, mean DMFT was 21.2 (decay 1.4, missing 7.1, filling 12.8) and mean secretion of saliva was 2.3 ml/5min (4.6 ml/min). Sjögren syndrome patients showed higher DMFT and lower secretion of saliva than the control group. The patients with lower salivary secretion showed lower buffering capacity and were detected more mutans streptococci and lactobacillus. Candida albicans were often detected in the patients using removable denture. It was concluded that the Sjögren syndrome patients had high caries risk and that the lower secretion of saliva would cause the higher caries risk.

O-25 Adaptation of Different Impression Techniques for Cast Post and Core. B. JIRAJARIYAVEJ, Y. S. SILAPABANLENG and K.KANCHANATAWEWAT* (Mahidol University and Chulalongkorn University*, Bangkok, Thailand).

Accuracy of cast posts and cores fabricated using an indirect technique relies on the accuracy and dimensional stability of impression materials. It is believed that by using these reinforcing components in addition to impression materials may reduce any distortion of elastomeric materials. This study was to evaluate the accuracy of cast post's adaptation into a canal surface using different reinforcing components for indirect post and core techniques. An extracted human maxillary central incisor was prepared as a canal and duplicated to make a master canal. Four different types of impression materials were used to duplicate the master canal: Type 1) Addition silicone (AS, Elite H-D); Type 2) Polysulfide (PS, Kerr); Type 3) Condensation silicone (CS, Coltex and Coltoflax, Coltene.); and Type 4) Polyether (PE, ESPE). Each impression material was performed using four different reinforcing components: Group A) no reinforcing component to be serve as a control, Group 2) a smooth wire; Group 3) a spiral wire; and Group 4) a plastic pin. All posts and cores were fabricated on their respective working casts and were cemented on the master canal using a low viscosity AS as per a cement replica technique. The replica was then embedded in silicone and sectioned in half in a bucco-lingual direction. Gap measurements (μm) were measured at seven different locations (margins, internal angles, axial walls, and apex). ANOVA and Tukey statistical analyses ($p < 0.05$) were performed on the data. There was no significant difference among AS and PS using four different reinforcing components. No significant difference was also found in all tested impression materials without any reinforcing component. The control groups of CS (80 \pm 25) and PE (38 \pm 15) showed lesser gaps than groups using spiral wires (CS, 165 \pm 52; PE, 135 \pm 61) and plastic pins (CS, 150 \pm 48; PE, 80 \pm 28). When a smooth wire is used, PS (41 \pm 9) showed lesser gap than AS (54 \pm 13) at an axial wall. The results indicate that the use of any reinforcing components has a significant effect on the accuracy of a cast post and core.

O-22 Effect of organic additive on the separation of salivary anions by ion chromatography. Z.F. CHEN*, B.W. DARVELL, V.W.H. LEUNG (Dent. Mater. Sci., HKU)

The behaviour of iodide and thiocyanate ion, as well as 7 other anions reported as components of human saliva, was investigated under various ion chromatographic conditions. Reagent grade chemicals and deionized water (18 megohm-cm at 23 °C) were used to prepare solutions with ion concentrations ranging from 1 to 100 mg/L which were analysed on an ion chromatograph (DX-100, Dionex, CA, USA) equipped with an anion guard column (IonPac AG-4A), anion separator column (IonPac AS-4A), suppressor (ASRS-1) and a conductivity detector. The flow rate of the mobile phase was set at 2.0 mL/min. Data acquisition and analysis programs (DaqBook, IOTech, OH, USA; PeakFit 4.0, SPSS, IL, USA) were used for retention times with 5 eluents: (E1) 1.7 mM NaHCO₃ + 1.8 mM Na₂CO₃; (E2) E1 + 1 mmol/L tyrosine; (E3) E1 + 1 mg/L p-cyanophenol; (E4) E1 + 10 mg/L p-cyanophenol; (E5) E1 + 100 mg/L p-cyanophenol. Iodide and thiocyanate were eluted in E5 in the shortest time (Table). Elution order was not affected by the additives. These results show the feasibility of detecting multiple anions in human saliva using IC. Eluent E5 seems a better choice for human saliva than the others. Supported by Res. Stud. Support Fund, HKU.

Retention time / min	E1	E2	E3	E4	E5
I-	10.81 \pm 0.16	20.06 \pm 0.26	9.667 \pm 0.201	8.697 \pm 0.197	6.781 \pm 0.386
SCN-	18.80 \pm 1.38	22.33 \pm 0.95	18.31 \pm 0.52	16.24 \pm 0.42	11.70 \pm 0.76
Ratio	0.58	0.90	0.53	0.54	0.58

O-26 Influences of various bleaching agents on fracture resistance of endodontically treated anterior teeth. S. Teptoranintra*, P. Benjakul, S. Dhanasomboon, C. Cheunarrom (Dept of Prosthodontics) Fac of Dentistry, Prince of Songkla University, Had Yai, Songkla, Thailand 90112.)

Internal bleaching is popular technique for improved esthetic of endodontically treated teeth. There is, however, a major side effect that is prone to evidence of external root resorption. Moreover, bleaching agents are able to resorb both organic and inorganic materials. Thus, internal bleaching agents may influence dentine hardness of endodontically treated anterior teeth. This study aimed to determine whether various bleaching agents were able to influence dentine hardness of endodontically treated anterior teeth. Twenty-four endodontically treated anterior teeth were divided randomly into three groups of eight. All teeth were based with ZnPO₄ and glass ionomer type II were applied on the mesial side of pulp chamber which were referred to as the control side. The bleaching agents were applied (hydrogen peroxide 30%, sodium perborate mixed hydrogen peroxide: 30%, sodium perborate mixed distilled water) twice to another side of the pulp chamber. All teeth were sectioned into 5 levels (pulpal horn, beyond CEJ 2 mm., CEJ, under CEJ 2 mm., under CEJ 4 mm.). Knoop hardness of three imaginary lines of each level were measured every 250 microns from the pulp chamber. The analysis of Covariate (ANCOVA) was used to test the difference among the bleaching groups. The results were shown that the dentine hardness of endodontically treated teeth were significantly lower than the control side in all groups of bleaching agents. The dentine hardness of group 1 & 2 were also significantly lower than group 3. It is important to be aware of the fact that bleaching agents reduce dentine hardness, which may lead to tooth fracture after pin tooth treatment.

O-23 Orthodontic treatment need in a sample of 16-year-old Malaysian schoolchildren according to the Dental Aesthetic Index. Baharon MR, R. Esa* (Faculty of Dentistry, University of Malaya, 50603 Kuala Lumpur, Malaysia)

There is a scarcity of data describing dental appearance in Malaysian students despite its importance in social epidemiology and clinical decision making. The purpose of this study was to determine malocclusion and orthodontic treatment need in a sample of 16-year-old schoolchildren using the Dental Aesthetic Index (DAI), and to assess the relationship between malocclusion and socio-demographic variables, perceptions of need for orthodontic treatment, aesthetic perception and social functioning. The sample comprised of 510 schoolchildren attending 10 secondary schools in urban and rural areas of Batu Pahat District in Johore. There were 276 Malays and 234 Chinese. The sampling procedure involved a multistage and stratified random sampling. Each subject was administered a questionnaire followed by an intra-oral examination for occlusal status using the DAI. The mean DAI score for all subjects was 26.0. About 53% of the subjects had a dental appearance requiring no treatment. Only 8.6% of the subjects had handicapping malocclusion that needed mandatory treatment. Malocclusion, as defined in this study, was found to be significantly associated with subjects' area of residence ($P < 0.05$). Significant associations were found between mean DAI scores and perception of need for orthodontic treatment, satisfaction with dental appearance and social functioning ($P < 0.05$). These findings had indicated the usefulness of DAI as a screening tool for prioritising orthodontic treatment needs which can be adopted by the public dental service.

O-27 Clinical evaluation of patients after placement of partial dentures for 1 year. K. Kiattisirirote, P. Benjakul (Dept of Prosthodontics), R. Tanpaisan (Dept. of Stomatognathology) Fac. Of Dentistry, Prince of Songkla University, Had Yai, Songkla 90112, Thailand)

Effects of placement of removable partial dentures on abutment teeth and intraoral environments were investigated after 1 year. Gingival sulcus depth, gingival index, plaque index and tooth mobility of abutment and non-abutment teeth were determined in 56 partial dentures of 35 patients before and after placement of the dentures for 6 months and 1 year. *S. mutans*, *Lactobacilli spp.* and fungus levels were also determined. Plaque index gingival index and gingival sulcus depth of abutment teeth were significantly increase after 1 year compared to those of non-abutment teeth ($p < 0.05$). Means of gingival sulcus: depth of abutment teeth at 0 month, 6 months and 1 year were 2.14, 2.37, 2.57 mm respectively whereas those of nonabutments were 2.11, 2.15, 2.16 mm. The percentage of teeth which contained plaque index score < 2 at baseline, 6 month and 1 year were 6.26, 1.39 and 1.39%, respectively (abutments) and 21.94, 13.61 and 14.72% (nonabutments). In addition, the percentage of teeth that gingival index score < 2 were 99.43, 96.60 and 53.82%, respectively (abutments), and 99.72, 99.16 and 95.27% (nonabutments) at the period time mentioned above. Fungus and *S. mutans* counts were increased significantly after wearing the dentures 6 months ($p < 0.05$). But *Lactobacilli spp.* levels were not significantly different. The study represented the risks to periodontal disease and caries of patients who wore partial dentures in cases of insufficient oral hygiene care.

O-24 Problems Reported by Patients after Occlusal Splint Insertion. A. LADPLI* W. SUKARAWAN, B. KORNHIT, and S. NAKBOONNUM. (Department of Occlusion, Faculty of Dentistry, Chulalongkorn University).

The purposes of the study were to indicate problems those may happen to patients after occlusal splint insertion. Data for this study were collected from 38 patients who had occlusal splint therapy at the department of occlusion, faculty of dentistry, Chulalongkorn University. On the first follow up visit patients were asked to answer the questionnaire that included questions concerning problems after occlusal splint insertion. The short-term problems most frequently reported were the discomfort in the mouth (55.26%), increased salivation (42.11%), speech problem (31.58%) and dry lips (31.58%). Other problems reported were orofacial muscle fatigue, tooth pain, pressure on the teeth, halitosis, tight splint, ulceration and insertion problem. When asked to rate the bothersome of the problems, all of the patient (8 persons) who reported tooth pain caused by splint rated this problem to be the most bothersome while only 33% of the patients who reported the discomfort in the mouth rated the discomfort to be the most bothersome. However, 81.08% of the patients stated that they had already become used to wearing splints at the day the questionnaires were taken. The conclusion of this study was that patients may face problems after splint insertion but most of which temporarily existed. The problems were less significant after patients had accustomed to their appliances. This study was supported by Dental Research Fund #3/1999, Faculty of Dentistry, Chulalongkorn University.

O-28 Stress Corrosion Cracking Behavior of Commercially Pure Titanium. H. H. HUANG*, C. C. HSU and M. S. HUANG, (Institute of Dental Materials, Chung-Shan Medical and Dental College, Taichung, Taiwan, ROC)

It has been reported that commercially pure (CP) titanium can corrode in fluoride-containing prophylactic agents. However, the information concerning the stress corrosion cracking (SCC) behavior of CP titanium in the fluoride-containing environment is still limited. The objective of this study was to characterize the stress corrosion cracking behavior of CP titanium in acidic NaF-containing 1% NaCl solution by using slow strain rate tensile testing (SSRT) technique. The strain rate used was $1 \times 10^{-6} \text{ s}^{-1}$. The NaF concentration was in the range from 0 to 1%. After SSRT, the primary fracture plane and the side surface of all cylindrical test specimens were observed by a scanning electron microscope (SEM). Surface chemical analysis was performed by using X-ray photoelectron spectroscopy (XPS). The results showed that no significant difference in the stress-strain curves was observed for CP titanium during SSRT in all test environments. Based on the results of SEM observations, CP titanium was immune to SCC when NaF concentration was lower than 0.01%. However, when NaF concentration was higher than 0.1%, pitting corrosion was observed on the side surface of specimen, which was due to the deterioration of passive oxide film, mainly TiO₂, on CP titanium surface. The presence of higher NaF concentration ($\geq 0.1\%$) could participate in the crack initiation process by forming surface pits and cracks on CP titanium, and eventually promoted the occurrence of SCC. This research was supported by the National Science Council of the Republic of China (NSC 89-2216-E-040-001) and Chung-Shan Medical & Dental College (CSMC 88-OM-B-013).

O-29 CRYSTALLITE SIZE OF HYDROXYAPATITE IN BEAT-TREATED HUMAN DENTIN
Y.K.E. Arianto*, Na Peng Bo: Graduate Program of Materials Science, Faculty of Natural Sciences and Mathematics, University of Indonesia

The knowledge of crystallite and particle size are important aspects in the study of crystal growth such as crystal growth in human apatite of dentin and enamel. This study sought to evaluate variations in crystallite size of hydroxyapatite (HA) of human dentin after exposed to heat. Fourteen dentin discs were cut occlusally from extracted third molar teeth and stored in distilled water at 4 °C before used. Specimens were examined by X-Ray diffraction technique (Philips X-Ray Diffractometer Type PW 3710 based with Co anode tube) before and after heat treatment at 150 °C, 600 °C, 750 °C and 830 °C respectively. Dentin crystallinities were calculated by Scherer Equation after profile fitting using reference specimens of Quartz. Thermal analysis on dentin discs were done by Differential Scanning Calorimeter (DSC-50, Shimadzu, Japan) to identify structure stability until 700 °C at rate of 10 °C/min. The results showed greater intensities of HA diffraction peaks pattern at 600 °C, 750 °C and 830 °C, with increased crystallite size at higher temperature. DSC analysis revealed endothermic curve at 285 °C and exothermic curve at 498 °C. It can be concluded that crystallinities of HA in dentin may increase when they are heated with consequence of organic structure decomposition at higher temperature.

O-30 Efficient Penetration of Propylene Glycol as a Vehicle for Intracanal Medicaments. E. V. CRUZ^{1,2}, K. KOTA¹, M. IWAKU¹, E. HOSHINO², (Dept. of Operative Dentistry and Endodontics¹ and, Oral Microbiology², Niigata University, Japan; Manila Central University³, Philippines)

The purpose of this study was to determine the efficiency of propylene glycol (PG) as a vehicle for intracanal medicaments in root canal therapy using a dye diffusion experiment. To compare the ability of PG and distilled water (DW) to deliver dye across dentinal tubules, de-crowned extracted human teeth were used. The upper part of the root canals were enlarged with a Peeso reamer and ultrasonically irrigated with 5% NaOCl to remove smear layer. In experimental conditions requiring artificial smear layer, softened dentin was closely adapted to the root canal walls using finger spreader. Cementum covering the upper third of the root was removed parallel to the root canal surface. The remaining two-third was entirely covered with inlay wax. Safranin in PG and in DW were introduced into root canals under two different conditions, i.e. with and without smear layer. Dye diffusion through dentinal tubules was determined spectrophotometrically or microscopically. Results showed that PG was efficient in allowing the diffusion of dye through the dentinal tubules, notably in the absence of smear layer as compared with DW ($p < 0.0001$). In fact, PG permitted the passage of dye through the root canal system in as fast as 7 seconds in a mono-rooted maxillary premolar ultrasonically irrigated with 5% NaOCl. Smear layer significantly delayed the diffusion of dye both with PG ($p < 0.0001$) and DW ($p < 0.0001$). The results of this study show that PG could quickly and efficiently deliver intracanal medicaments through the root canal system. Supported by Grants 11307044 and 12557182.

O-31 Time Required to Finish a Prosthodontics Treatment in a Thai Dental School. P. BENJAKUL, C. CHEUNARROM (Dept. of Prosthodontics, Fac. Of Dentistry, Prince of Songkla University, Had Yai, Songkhla 90112, Thailand)

Between 5.2% and 86.2% of the students over the 9 years that this study was taken, did not finish their minimum requirements on time in the Prosthetic Clinic. This study was done to examine the length of time for each step of each prosthesis, and to identify the factors that delayed the treatment time. Records of patients who had been treated with a prosthesis (fixed and removable prosthesis), by 5th and 6th year dental students, were studied from 1988 to 1997 to determine the time required for each step for fabrication for each minimum requirement of the prosthesis. All appointments for each prosthesis were recorded (each appointment took about 1-3 hours) as follows: two acrylic partial dentures, one partial denture (cobalt-chromium), one complete denture, one repair or relines or rebase, one crown, one cast post and core/crown, and one three-unit bridge and all these needed 17, 10, 16, 3, 8, 10 and 11 appointments, respectively. Each student completed 1-2 appointments on each step of each prosthesis. However the students need to improve their capabilities so that they can finish 2-3 steps in one visit. Open questions concerning why students could not finish their work on time were completed by dental students. Staff responsible for fixed and removable prosthodontics were also interviewed at the end of the academic year. The students concluded that 4 factors effected their failure to complete the minimum requirements: (1) the students themselves, (2) the patients (3) the department's rules, and (4) the instructors. Nonetheless the opinion of the staff was that the students themselves were the main cause, while the other factors could be managed. It was concluded that students spend more time to finish each of their prosthodontics work because most of them finished only the minimum requirement, which is not enough to build up their competency in clinical practice after they graduate.

O-32 MDM2 expression in areca quid chewing-associated oral squamous cell carcinomas in Taiwan. J.S. HUANG*, C.P. CHIANG, S.H. KOK, Y.S. KUO and M.Y.P. KUO (School of Dentistry, National Taiwan University, Taipei, Taiwan)

To investigate the involvement of MDM2 overexpression in the pathogenesis of oral squamous cell carcinomas (SCCs) in Taiwan, we examined the expression of MDM2 protein and its relationship to p53 protein levels in 52 oral SCCs. Of the 52 patients, 36 (69 %) had tumors with positive MDM2 staining and 32 (61%) had tumors with p53 staining. Co-expression of MDM2 and p53 was detected in 25 (48%) cases; and 9 (17%) tumors showed neither MDM2 nor p53 staining. Significant correlation was observed between MDM2 and p53 staining in 38 cases with areca quid (AQ) chewing habit ($p=0.032$). No significant correlation was found between the degree of MDM2 staining and the patients' ages, sex, cancer location, clinical staging, primary tumor TNM status or differentiation of SCC. The Kaplan-Meier analysis showed that either MDM2 or co-expression of p53 and MDM2 did not relate significantly to patient overall survival. Nevertheless, the high prevalence of MDM2 overexpression found in this study suggest that MDM2 may also participate in the carcinogenesis of oral SCCs in Taiwan.

O-33 Reduced expression of the cell-cycle inhibitor P27^{Kip1} is correlated with poor prognosis in oral squamous cell carcinomas in Taiwan. H.Y. HSU*, C.P. CHIANG, S.H. KOK, Y.S. KUO and M.Y.P. KUO (School of Dentistry, National Taiwan University, Taipei, Taiwan)

The cyclin-dependent kinase (cdk) inhibitors play important roles in cell cycle progression in normal cells. Decreased expression of the cdk inhibitor P27^{Kip1} has been correlated with poor prognosis in a variety of human tumors. We examined the expression of P27^{Kip1} in oral squamous cell carcinoma (SCC), epithelial dysplasia (ED) and normal oral mucosa (NOM) using antibodies to P27^{Kip1}. Positive P27^{Kip1} nuclear staining was detected in all the specimens from ED and NOM, whereas P27^{Kip1} staining was observed in 24 of 63 (38.1%) cases of oral SCC. The positive staining rate of P27^{Kip1} in oral SCC was significantly lower than that in NOM ($P < 0.001$). No significant correlation was found between the expression of P27^{Kip1} and the patients' age, sex, oral habit and cancer TNM status. The Kaplan-Meier analysis showed patients with P27^{Kip1}-positive tumors had significantly higher overall survival than those with P27^{Kip1}-negative tumors ($P < 0.01$). These results indicate that loss of P27^{Kip1} expression may be a valuable factor for determining prognosis in oral SCC patients in Taiwan.

O-34 Detection of oral precancerous and cancerous lesions by Raman Spectroscopy. P.F. DAYAL* and M. VENUGAL, FMC-College of Dental Surgery, Mangalore, India

Raman Spectroscopy (RS) is a laser spectroscopic method to probe the vibrational energy levels of molecules within a sample and to plot the scattered intensity as a function of energy differences of scattered photons. This phenomenon analyses the molecular structures of compounds by means of their spectral characteristics. Hence RS can be used to diagnose oral precancerous (PCL) and cancerous (CL) lesions in humans both in vivo and in vitro. The aim of the study was to explore the potential of RS in early detection of oral PCL and CL, after comparing their histopathological features. The study was conducted on 47 randomly selected subjects (17 with PCL and 30 with CL). Histopathological examination and RS evaluation were done from the biopsied samples. Sensitivity, specificity and p-values were statistically calculated. The results showed 100% sensitivity and 93% specificity in detection of oral PCL; 90% sensitivity and specificity in detection of oral CL. p-values for oral PCL and CL was more than .0001, i.e. very highly significant. It was concluded that RS can be used as a valuable screening tool for detection of dysplastic tissues amongst Oral PCL and CL.

O-35 Signaling pathways in response to betel quids induced cellular stress J.T.H. YEH* and H.H. YEN (School of Dentistry, China Medical College, Taichung, Taiwan)

Betel quid chewing habit is highly associated with oral squamous cell carcinoma. Several studies have demonstrated betel nut ingredients are genotoxic and cytotoxic. However, it's still not clear how the cellular signaling pathway involved in betel quid related carcinogenesis. Our object for this study is to demonstrate the signal transduction pathway responding to stimulation by safrole, a component of betel piper. By Western blot analysis, it shows phosphorylation of p38 MAPK (Mitogen activated protein kinase) and MKK (MAP kinase kinase) 3/6 in safrole-stimulated oral epithelial cells and fibroblasts, which is not observed in the control group. The induced p38 MAPK phosphorylation is time-dependent and specific. This finding suggests p38 MAP kinase pathway plays a role in response to safrole induced cellular stress. This study was supported by the NSC student grant, NSC 89-2815-C039-001B.

O-36 Determination of noise levels and threshold in a digital subtraction radiography system. M.S. WOO, K.Y. ZEE*, E.F. CORBET (Faculty of Dentistry, The University of Hong Kong)

The aims of this study were to determine the noise levels and threshold in a digital subtraction radiography (DSR) system using intraoral radiographic images acquired by scanner. For the determination of noise levels, 10 standardized periapical radiographs of the same lower molar region of a human dry skull were taken. 24 sockets from 3 human dry skulls were used for determination of threshold and radiographs were taken before and after inserting a definite amount of bone ash. The radiographs were processed with an automatic developing machine and digitized by a scanner. The paired images were then aligned by matching a fixed line on both images. Differences in brightness and contrast of the images were corrected by non-parametric normalization algorithm before subtraction. A region of interest (ROI) without changes was defined in the 10 subtracted image for noise levels determination. The percentages of pixels deviated from a pre-set threshold value of the ROI were evaluated. A ROI with bone ash added and a ROI without change were selected in the 24 subtracted images for calculating the sensitivity and specificity. A value of 7 to 10 was applied in order to determine the optimal threshold for the system. Results were shown in the table below:

Threshold value	7	8	9	10
Noise levels	0.7-11%	0-7%	0-3%	0-2%
Sensitivity	90%	86%	81%	75%
Specificity	93%	96%	98%	99%

The noise level of the system was within 10% when the threshold value was between 8-10 while the sensitivity and specificity were over 85% and 95% respectively when threshold was between 7-8. Hence, the most acceptable threshold for the present DSR system is 8. Further validation of the system both *in vitro* and *in vivo* using this threshold is necessary.

O-37 Determination of ABO blood grouping using tooth material

Supporting information for forensic identification

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Tooth is the most robust and stable part of the human body, and therefore potentially very useful for identifying severely burned bodies for forensic purposes. However, conventional dental records may not be available or sufficient for such purpose. To study the efficiency and robustness of ABO blood grouping from tooth material, extracted tooth samples from 145 people were ABO blood grouped by absorption elution technique from enamel, dentine and pulp, with direct blood grouping at the time of extraction as control. Of the 145 tooth samples, a half of 54 teeth without caries and 55 whole teeth with caries were blood grouped immediately. The other half of the 54 teeth without caries were stored at room temperature (25±4°C) for one month.

The results show that enamel, the proportion of correctly ABO blood grouped tooth samples without caries was only 37 to 59% and significantly smaller ($p < 0.01$) than from dentine, pulp or control (blood). In comparison, for dentine and pulp 94 to 100% of the results were correct, and there was no significant difference between dentine, pulp and control immediately after extraction. With the exception of relatively unreliable blood grouping from enamel, storing non-carious teeth for one month at room temperature appears to exert no significant influence in comparison with immediate blood grouping after extraction. However, one month underground made it significantly less likely ($p < 0.01$ for dentine and pulp) to achieve correct blood grouping from non-carious tooth material in comparison with immediate blood grouping after extraction or one month storage at room temperature. For dentine and pulp, only 65-78% of blood grouping results were correct for teeth with caries. Particularly caries pulp appears to make correct blood grouping from tooth material (dentine and pulp) significantly less likely ($p < 0.01$) than from teeth with no caries. Similar tendency for teeth with caries dentine was weaker, but there was no significant difference in correct blood grouping from teeth with caries dentine and caries pulp.

The results confirm that enamel alone is unreliable material for ABO blood grouping. However, dentine, pulp and probably whole teeth without caries can be used for blood grouping with reasonable confidence. The material from a single tooth appears sufficient for blood grouping in such cases. The results also imply adverse effects of microbial contamination by caries and soil contact, which can limit the reliability of correct blood grouping from teeth in forensic applications. When the choice is possible, tooth material with as little caries as possible should be used.

P-4 Microbial-flora of root canals at the time of root filling and the outcome of treatment.Y.F. Mak¹, G.S.P. Cheung (Conservative Dentistry, Faculty of Dentistry, The University of Hong Kong, Hong Kong SAR, China)

The role of bacteria in the pathogenesis of pulpal and periapical diseases is well documented. The presence of bacteria in the root canal at the time of obturation may have an impact on the outcome of treatment. The present study investigated the microflora of root canal at the time of root filling and the outcome of treatment. Samples were collected in the student clinic from teeth undergoing root canal treatment. At the obturation appointment, the root canal content was sampled prior to root filling and cultured anaerobically. 31 single rooted teeth were sampled and bacterial growth was detected in 17 teeth (55%). A total of 15 species were recovered, 2 of which were strict anaerobes and the remaining 13 were facultative anaerobic and aerobic organisms. All patients were invited for review in 6 months and 27 (response rate 87%) were examined. 13 teeth (48%) were considered as successful under strict clinical and radiographic criteria. No significant difference was detected among those teeth with or without positive culture at the time of obturation on the outcome of treatment. The result suggested that the presence of bacteria at the time of root filling did not affect the outcome of root canal treatment in the 6 months period. Long-term follow up is required to assess the impact of bacteria on the treatment outcome.

P-1The effect of rewetting agents on *in vitro* recurrent caries. *Ithagaran A¹; Tay FR¹; King NM¹; Wefel JS²; Pashley DH¹ (University of Hong Kong, HKSAR; ²University of Iowa, USA; ³Medical College of Georgia, USA)

This study examined the *in vitro* caries inhibiting potential of fluoride (FR) and non-fluoride-containing (NFR) rewetting agents that are applied to acid-etched enamel and dentin before the use of water-free, dentin adhesives. Twelve caries-free bicuspids were divided into three groups. 2 x 3 x 1.5 mm cavities were prepared on the mesial and distal surfaces of each tooth, with half of the cavosurface margin in enamel and half in cementum. In group I (control), One-Step (Bisco, Schamburg, USA) was applied without etching or rewetting agents. In group II, cavities were acid-etched, air-dried for 2s, rewetted with a NFR (Aqua-Prep, Bisco) for 20s, and then bonded with One-Step. Treatment for group III was similar to group II, except that a FR (Aqua-Prep F, Bisco) was used. Bonded cavities were restored with a non-fluoride-containing composite (EliteFlo, Bisco). Artificial carious lesions were induced in these specimens, from which 100±20 µm thick longitudinal sections were subsequently prepared; yielding 16 specimens per group for evaluation with polarizing light microscopy and microradiography. Representative sections were processed for transmission electron microscopy (TEM). Undemineralized ultrathin sections were examined unstained. Results: The outer lesion depths (µm) were 116±5, 114±5 and 113±7, and the lesion areas (µm²) were 21,562±2,035, 14,966±1,819, 10,829±2,302 for groups I, II and III respectively. The differences were not statistically significant for lesion depth ($p > 0.5$, ANOVA, Duncan's test), but highly significant for lesion area ($p < 0.001$). Wall lesions were consistently present in group I, while inhibition zones were invariably observed in group III. 87.5% of group II specimens exhibited neither wall lesions nor inhibition zones. Inhibition zones in Group III had a mean width of 52.80±18µm. TEM showed that remnant dentin crystallites within the inhibition zones in group III were larger and denser than the corresponding wall lesions. They were of the same density and size along the same lesion depth in group II specimens. It is hypothesized that a fluoride-containing rewetting agent inhibits recurrent caries *in vitro* by altering apatite dissolution. (Supported by University of Hong Kong CRC grant 10202354)

P-5"COMPARISON BETWEEN GTF 3-D MODELS PROVIDES POSSIBILITY FOR VACCINE DEVELOPMENT" Y.-W. TSAI¹, Y.-Y. SHIAU¹, J.-S. CHIA¹, H.-C. CHOU¹, Y.-C. LIAW¹, K.-L. LOU¹ (Graduate Institute of Oral Biology, College of Medicine, National Taiwan University, Taipei 100, TAIWAN.)

Glucosyltransferases (GtfB/C/D) of *S. mutans*, a pathogen for human dental caries, synthesize water-insoluble glucan through hydrolysis of sucrose. Genetic and biochemical approaches have identified several active sites of these enzymes, but no three-dimensional structural evidence is yet available to elucidate the subdomain arrangement and molecular mechanism of catalysis. Based on a combined sequence and secondary structure alignment against known crystal structure of segments from closely related proteins, we propose here the 3-D models of the N-terminal domains essential for the sucrose binding and splitting in all three GTFs. Tim-barrel of (α/β), structural characteristics is revealed and the structural correlation for two peptides Gtf-P1 and Gtf-P2 (active sites) is described. Functional analysis according to the recognition of antibody against Gtf-P1 by reducing the enzymatic activity has also been accomplished. Conclusion: Monoclonal antibody against Gtf-P1, which then influences Gtf-P2, can be good candidates for developing vaccines to prevent human dental caries via disturbing GTF enzyme function. (supported in part by grant NSC 89-2314-B-002-258)

P-2The First Report of *Candida dubliniensis* from Human Root Caries Lesions. S SHEN, H.K. YIP*, L.P. SAMARANAYAKE and J.E. DYSON (Faculty of Dentistry, The University of Hong Kong, Hong Kong BAR, China)

Candida dubliniensis is a newly described fungal species generally isolated from HIV-infected patients and considered an emerging opportunistic oral pathogen. However there are recent reports of its carriage in healthy individuals as well as in non-oral sites. As little is known about the prevalence of *Candida dubliniensis* in root caries lesions, we characterized 29 yeast isolates from root caries lesions for the presence of this potential pathogen. A total of 29 *Candida* isolates were obtained from 19 root caries lesions in elderly ethnic Chinese (12 patients, mean age 81.67 ± 6.30, 3 males and 9 females) as described in our previous communication (Shen et al. J Dent Res 2000;79 special issue:395). *Candida* species were identified using the "germ tube" test, API 20 AUX yeast identification kit with a newly updated identification database (bioMerieux sa, Marcy-l'Etoile, France) and growth at 45°C for 48 hrs (Jabra-Rizk et al. J Clin Microbiol 1999;37:1464). All yeasts were biotyped using the method of Williamson et al. (Microbios 1987;51:195). Among 29 yeast isolates, three were identified as *Candida dubliniensis* (10.34%), two were *Candida glabrata* (6.90%) and the remainder were *Candida albicans* 1 (82.76%). The biotypes of all isolates varied considerably. Our study reports, for the first time, the presence of *Candida dubliniensis* in root caries lesions. The presence of this rather virulent breast pathogen in root caries lesions of elderly is disconcerting, as it may cause systemic morbidity in compromised situations. (Supported by a CRCG grant of the University of Hong Kong, Hong Kong BAR, China.)

P-3

Intra- and Inter-species Coaggregation of Bacterial Isolates from Root Surface Caries Lesions. S SHEN*, L.P. SAMARANAYAKE and H.K. YIP (Faculty of Dentistry, The University of Hong Kong, Hong Kong SAR, China)

Bacterial coaggregation reactions between different species and the autoaggregation of the same species are associated with the initiation and development of dental plaque and biofilms. As no such data is available on bacterial isolates from root caries lesions, we evaluated the coaggregation of 22 different bacterial species comprising 10 different genera, from human root caries lesions. Bacteria were isolated from 30 root caries lesions in elderly Chinese and identified using standard microbiological criteria (Shen et al. J Dent Res 2000;79 special issue:395). Intra- and inter-species coaggregation was evaluated both by a qualitative visual scoring system (Cisar et al. Infect Immun 1979;24:742) and a quantitative spectrophotometric assay (McIntire et al. Infect Immun 1978;21:978). The quantitative coaggregation assay we used proved to be a more sensitive method than the qualitative visual evaluation as the results yielded the percent coaggregation. Inter-species coaggregation was seen between: 1) *Actinomyces* spp. and *heillonella* spp.; 2) *A. israelii* and *Peptostreptococcus prevotii*; 3) *Actinomyces* spp. and *Bacteroides gracilis*; 4) *Bacteroides intermedius* and 9 different species; and 5) *Fusobacterium* spp. and 6 other species. These results imply the existence of multiple interactions between the congregation inducing bacterial species during root caries formation. In particular, *Actinomyces* V. *Veillonella* *Bacteroides* spp. and *Fusobacterium* spp. appear to play a significant role in this context. (Supported by CRCG grant of the University of Hong Kong, Hong Kong SAR, China.)

P-6Cytotoxicity of Fluoride on Human Pulp Cell Cultures *in vitro*. K.W. Tai¹, Y.C. Chang (School of Dentistry, Chung Shan Medical and Dental College, Taichung, Taiwan)

The use of glass-ionomer cements in restorative dentistry has increased considerably, due to their excellent chemical properties. Numerous studies have revealed that conventional glass-ionomer cements may release fluoride into an aqueous environment. However, the sensitivity of cultured human pulp cells to fluoride has not been adequately studied. The objective of this study was to examine the effects of fluoride on human pulp cells *in vitro*. H33258 fluorescence, cell proliferation, protein synthesis and mitochondrial activity assay were used to investigate the pathobiological effects of fluoride on cultured human pulp cells. Fluoride showed cytotoxic effects on human pulp cells during a 24-hr culture period in a dose- and time-dependent manner ($p < 0.05$). Elevating the fluoride concentration to 20 ppm almost completely inhibited cell proliferation during 5 day culture period. Fluoride inhibited protein synthesis at 1 mM and higher concentration in a dose-dependent manner ($p < 0.05$). In addition, at concentrations of 2 mM through 8 mM, fluoride inhibited 20 % through 44 % of functional mitochondrial activities ($p < 0.05$). From the present study, fluoride was found to be a cytotoxic agent to cultured human pulp cells. The cytotoxic effects of fluoride on human pulp cells depended on the exposure dose, frequency, and duration.

P-7SALIVARY CONCENTRATIONS OF CHLORIDE AND THIOCYANATE AFTER THE CHEWING OF MESWAK. R.A. JALIL¹, K. SUSHIL and L.A. SITI. (Faculty of Dentistry, University of Malaya, Kuala Lumpur, MALAYSIA)

The most widely used chewing stick is the meswak which is obtained from the plant, *Salvadora persica* that mainly grows in the Middle East. Meswak is believed to contain substances of value for the prevention of caries and periodontal disease. The objective of this study was to determine the effect chewing of two differently sized commercially available meswak may have on levels of chloride and thiocyanate in whole saliva as opposed to the chewing of an inert material i.e. cotton roll. Twenty subjects participated in this study. They were distributed into two groups (A and B). Subjects in both groups A and B first chewed on meswak (5mm and 10mm diameter respectively) followed by the chewing of an equivalent sized piece of cotton roll (sized #1 and #2 respectively). The titration method was employed for the analysis of chloride whilst thiocyanate levels were determined using spectrophotometer. Higher levels of chloride were registered after meswak chewing compared to cotton roll in both groups A (33.64 mM ± 5.78, 11.48 mM ± 2.07) and B (22.02 mM ± 6.23, 10.42 mM ± 1.02) at $p < 0.001$. Although higher levels of thiocyanate were seen in both groups A (0.51 mM ± 0.16, 0.47 mM ± 0.14) and B (0.50 mM ± 0.22, 0.39 mM ± 0.20) after the chewing of meswak compared to cotton roll, the increase was only statistically significant in group B at $p < 0.001$. These findings suggest that plants used as chewing sticks may have the potential of releasing substances into saliva that could influence the state of oral health.

P-8 Diagnosis and recprd of early carious lesions in a caries prevention program
Y. SONGPAISAN, P. PHANTUMVANIT, S. BENJASUPATTANANAN,
M. PRUKSAPONG Thammasat University, Pathumtani, Thailand.

Early diagnosis and prompt treatment of early lesion of dental caries especially in high risk group of children should be practiced and follow up. A baseline study for oral health promotion in school was carried out in 405 teenagers (age 16-18 years old) in a suburb district of Pathumtani. Caries status (frank carious cavities) and early/initial carious lesions as well as the oral hygiene status rated by Simplified Debris Index (DI-S) were assessed by three dentists (overall $\kappa = 0.7$ for caries & 0.65 for DI-S) The results revealed the basic DMFT and DMFS were 3.43 ± 3.37 and 6.24 ± 6.92 respectively. The decay (D) component contributed mostly at 2.72 ± 2.97 (79.3%) teeth and 4.30 ± 5.16 (68.9%) surfaces respectively. When initial carious lesions were included, the decay component was significantly ($p < 0.005$) increased to 5.35 ± 3.81 teeth and 7.94 ± 6.22 surfaces respectively. When the subjects were grouped according to their debris scores (DI-S) as 0-0.5 (0.34 ± 0.13), $>0.5-1.0$ (0.80 ± 0.14), $>1.0-2.0$ (1.4 ± 0.27), and $>2.0-3.0$ (2.34 ± 0.19). The differences of DMFT and DMFS among the four DI-S groups were not significant ($p > 0.05$) as other studies had reported. It could be concluded that oral hygiene was not a main factor contributed to caries risk. Moreover, if carious lesions were early found and then were treated by non-invasive methods, more than 50% of frank carious cavities could be controlled or delayed for the next few years. Supported by Sunstar Corporation, Japan.

P-12 Toothbrush Age : N. Hongprasong*, P. Natrirojanakun,
P. Pradumdsadeeporn and P. Nuangkrota. Dept of Periodontology,
Fact of Dentistry, Chulalongkorn University.

The purpose of this study was to determine the soft toothbrush age. Twenty four dental students, 6 in each group, were assigned to brush their teeth with soft brush for 4, 6, 8, and 10 weeks. Toothbrushes were collected for physical examination, wearing index and level of splaying by wear rating. Mean values were used for One way ANOVA analysis for wear index and Kruskal - Wallis test ($p=0.05$) for wear rating. Then, toothbrush bristles were prepared for scanning electron microscopic (SEM) observation. It was found that wear index and wear rating varied by time. Wear rating had mean rank 11.50, 11.50, 11.50 18.00 and 20.50 and mean \pm S.D. of wear index were 7.30 ± 5.60 , 15.46 ± 9.03 , 21.12 ± 13.02 , 31.43 ± 14.06 and 23.82 ± 10.63 mm. at 0, 4, 6, 8 and 10 weeks accordingly. Wear index was significantly different at 6 weeks while wear rating was significantly changed at 8 weeks when compared to those of control group. Wearing condition of bristle was also clearly seen in SEM at 8 weeks. However, only debris deposition not bacterial contamination was observed. It may conclude that at 8 weeks of used brush, wearing and splaying of toothbrush as well as debris deposition were clearly seen in this study. Therefore, we suggest that toothbrush should be changed at 8 weeks.

Supported by Dental Research Fund, Dental research project 3205-312/1998 Faculty of dentistry, Chulalongkorn University.

P-9 An Evaluation of community-based sealant program in Samutprakarn province, Thailand.
P.CUTCHAVAREE*, C.TUNG VIGITSAKUL, B.WADTAISONG,
P.EKKANTRONG, P.INTASARO, R.LEEWANUN (BMA., Bangkok).

Even though the sealant program has been implemented nation wide in Thailand since 1996, evaluation data are scarce on the sealant performance under community setting. This investigation was set to evaluate the retention and effectiveness of sealant in first permanent molars of primary school children after 6, 12 and 18-24 months. A total of 370 primary school children who had received dental sealant for at least 6 months at Samutprakarn province were randomly selected from treatment records. Calibrated dentists using dental explorers and mouth mirrors evaluated sealant retention and dental caries on the occlusal surface of first permanent molars. The results showed that only 67.2% were completely sealed during the first six-month and about half of the sealant were retained two years after application. The findings from this analysis revealed no increased risk for incomplete retention among the three groups. In addition, unsealed teeth experienced a higher rate of caries (16.9%) than those in sealed group (11.2%). These findings suggest that community-based sealant programs were effective in reducing dental caries and the moderate level of complete retention rate during the first six-month may indicated the need to improve sealant application technique.

P-13 FACTORS INFLUENCES THE SATISFACTION OF DENTAL SERVICES
YC LEE*, YH YANG, CC TSAI, and TY SHIEH (Graduate Institute of Oral
Health Sciences, Kaohsiung medical University, Kaoshiung ,Taiwan)

Patient satisfaction in dental services has become more important in many countries. Limited research has been done in Taiwan. The purpose of this study is to identify patient expectations, and to understand the factors related to their satisfaction in dental services. The study data consisted of two major groups: 583 patients recruited from dental clinics and 359 people from the general public in Kaohsiung City. Subjects' rating on the importance and satisfaction in dental service was collected by a questionnaire with 5-Likert scale. The results showed that the most importance factors were sterilization, clinic hygiene, dentists' techniques, and safety conscious, care, attention and communication provided by dentists. The least important factors included location and decoration of clinics. The sources of satisfaction in accordance of priority were attitude of the dentists, techniques, communication skill, hygiene and sterilization. Regression analysis showed that the main factors influencing the overall satisfaction of dental services were environment/equipment of dental clinic, techniques, convenience, staff efficiency and other services (include oral hygiene instruction). In general, clinic patients achieved greater satisfaction than general public, while the public had higher expectation. Patient had high expectation toward sterilization, hygiene, and dentists' technique, communication skill and attitude to patients. Patients' satisfaction was also affected by their socio-demographic factors.

P-10 The Prevalence and Distribution of Candida albicans in Oral Lichen Planus Patients. S. TANAKUN* and S. THAWEEBOON (Faculty of Dentistry, Mahidol University, Thailand)

The prevalence and distribution of *Candida albicans* in twenty oral lichen planus (OLP) patients were studied by imprint cultures. The results were compared with those of a randomly selected, age- and sex-matched control group without mucosal changes. *Candida albicans* were present in nine of OLP patients (45%). While the frequency in healthy adults was 5%. *Candida albicans* were all found on the lesion sites, buccal mucosa in eight cases and lip in one case. Local treatment with miconazole oral gel (Daktarin oral gel®) in nine patients with positive findings resulted in subjective relief of symptoms and clinical improvement in all cases. This study suggested that oral lichen planus patients have apparent association with the presence of *Candida albicans*. ($p < 0.05$)

This study was supported by Mahidol University Research Grant, 1997

P-14 Evaluation of students' perception of dental care for the terminally-ill patients.
C.S. HSU, AND C.S. TEO* (Department of Preventive Dentistry, Faculty of
Dentistry, National University of Singapore, Singapore)

Data from developed countries shows approximately one third of the population develops cancer, and about one third of these cancers can be cured (Twycross, 1995). People may survive for many years due to the improvement of health care and new technologies. Together with an aging population and some behavior-related issues (e.g. homosexual practices), the number of terminally ill cases (TIC) is increasing. Dental curriculum in the new millennium needs to respond to the social and professional calls to prepare new graduates to care for this group of patients. The purpose of this study was to identify the perception of a group of final-year students toward oral health care for TIC and evaluate the influence of a teaching program. A questionnaire survey, containing 12 questions with 10 using a 5-digit likert scale, was conducted before and after the lecture. A total of 30 students attended the lecture and responded to the questionnaire. The program was composed of a slide presentation, a mini lecture, and a 15-minute video introducing palliative care system in a hospice. The data was analysed using a single-sample and paired t-tests in a SPSS-10 program. The results of this survey have revealed students' knowledge level lower than staff expectation ($p < 0.05$) and a lack of experience in treating TIC ($p < 0.001$). Students were not well prepared from the psychological ($p = 0.032$) and technical perspectives ($p = 0.002$), and were afraid of treating HIV+ patients ($p = 0.02$). Nevertheless, students have significant level of willingness to volunteer to treat TIC ($p = 0.001$), dare to think about death issues ($p < 0.01$), and knew their long-term life goals ($p < 0.01$). Post-program evaluation indicated that students felt a significant improvement in the psychological and technical preparation for treating TIC (both $p = 0.001$), less fearful in treating HIV+ patients ($p < 0.01$), and were more certain of their long-term life goals ($p = 0.005$). In conclusion, the results of this survey revealed a less than desirable psychosocial characteristics and knowledge level in caring TIC. The results also help to provide guidelines in curriculum to shape the further development in the teaching of oral health care for TIC.

P-11 Oral manifestations of HIV infection in the northern Thai population: an epidemiological survey on 102 HIV-infected individuals. S. Pongsirwet*, A. Iamaron, V. Robison, S. Youngchim, S. Charlyatsak, K. Supparatpinyo, and T. Sinsanthana. (Chiangmai University Thailand, John Hopkins University, USA)

The objective of the present study was to assess types and prevalence of HIV-related oral lesions in a northern Thai population and to identify the association between CD4 count and oral lesions. The study population (N=102) were divided into 2 groups. The first group was a subset (N=57) of a parent study entitled "primary prophylaxis of systemic fungal infections in HIV-infected patients with itraconazole: a double-blind placebo-controlled study". The second group was HIV-positive individuals (N=45) who came to Sansai community hospital, Chiangmai, Thailand for a follow up for physical examinations. All subjects were tested for HIV infection and measured for CD4 count. The examinations for oral lesions were conducted according to WHO criteria. The results showed that 27 male and 75 female subjects had the mean age of 32.9 year. 70 % had CD4 count less than 200 cell/mm³. Oral lesions were found in 71 individuals (70%). Oral hairy leukoplakia was the most common lesion (N=39; 38.2%) followed by oral candidiasis (N=25; 24.5%), melanotic hyperpigmentation (N=24; 23.5%) and linear gingival erythema (N=15; 14.7%). Others were necrotizing gingivitis, recurrent aphthous stomatitis, herpes labialis, facial herpes zoster infection, enlargement of salivary glands, and swelling of head and neck lymph nodes (N=15; 14.7%). On analysis of association between CD4 count and the prevalence of HIV-related oral lesions, oral candidiasis and hairy leukoplakia were significantly associated with decreased levels of CD4 count (p -values ≤ 0.01 ; chi-square test), confirming that these lesions can be used as prognostic markers for disease severity. In conclusion, oral lesions in HIV-infected persons in northern Thailand remained prevalent and heterogeneous, indicating that improvement of oral conditions in this group of patients is highly needed. Supported by DANIDA.

P-15 Effect of the criteria for dental students' recruitment to their study achievement. P* Phantumvanit, Y Songpaisan and P Pisalchaiyong (Faculty of Dentistry, Thammasat University, Patumthani, Thailand)

Thammasat University Dental School is the only dental school in Thailand that recruits dental students from baccalaureates in stead of high school students. The criteria for illegible applicants is maximum age at 30 years, grade point average from bachelor degree not less than 2.5 and passed the entrance examination for 8 subjects including dental aptitude test. The objective of this study was to test the factors from dental students' recruitment criteria that might effect the achievement in dental education. The data was analyzed from the first four batches of 103 dental students of whom seven were dropped out. There were 3 factors in this study namely entrance examination score, number of years after bachelor graduate, and grade point average from bachelor degree. The statistical analysis between these three factors and the grade point average of each dental student was treated for correlation. The results showed that there was weak correlation in all factors, i.e. grade point from bachelor degree ($r=0.39$, $p < 0.001$), entrance examination mark ($r=0.33$, $p < 0.01$), and number of year after graduation ($r=0.25$, $p < 0.05$). Nevertheless, the results showed that grade point from bachelor degree seemed to have more effect to the achievement of present grade point average of the dental students whereas the number of year after graduation had less effect. It is concluded that the criteria for recruitment of dental students should be more flexible since all of them are weak correlated with the present grade point average.

P-16 High-strength GICs for the ART Technique: Two-year Results. Y. LUO*, E.C.M. LO, MW.FAN* and S.H.Y. WEI. (Faculty of Dentistry, The University of Hong Kong and *School of Stomatology, Hubei Medical University, Wuhan, China)

This study was a prospective randomized clinical trial to compare the clinical performance of two glass ionomer cements, ChemFlex (Dentsply DeTrey, Germany) with Fuji IX GP (GC, Japan), when used in the Atraumatic Restorative Treatment (ART) in China. 92 school children (6-14 years) who had 1-2 bilateral matched pairs of carious posterior teeth were included. A split mouth design was used to randomly assign the use of the two materials when placing restorations in the teeth on contra-lateral sides. The performance of the restorations was assessed at baseline, 6 months, 12 months and 24 months. The evaluation criteria were success (filling present and sound; or slight defect or wear less than 0.5mm) and failure (major defect or wear > 0.5mm; filling dislodged or in need of replacement). After two years, the cumulative survival rates of ART restorations in the primary teeth, were 93% for ChemFlex restorations and 90% for Fuji IX GP restorations placed in the Class I cavity preparations; while only 40% of Class II restorations were assessed as clinically satisfactory. In the permanent dentition, only Class I restorations were involved and the survival rates were 93% and 96% for ChemFlex and Fuji IX GP, respectively. Differences between the two materials were not significant for any type of restorations (p>0.05). The clinical performance of ART restorations was also assessed using the modified USPHS criteria. The results obtained were similar to that using the ART criteria. Silicon impressions were taken at each recall period and study casts were made in order to measure occlusal wear using the Rheinberger scale. After two years, the mean wear values for ChemFlex and Fuji IX GP in the permanent teeth were 74.5 ± 23.0 and 79.4 ± 25.4 micrometers, respectively. There was no statistical significant difference between the two materials (p>0.05). It is concluded that the clinical performances of ChemFlex and Fuji IX GP over a 24 months period were similar and they were satisfactory for use with the ART approach in Class I cavities in both primary and permanent teeth. (This study was supported in part by a grant from Dentsply DeTrey.)

P-20 Effect of Tom Yum Soup on Color Stability of 7 Composite Filling Materials.

C. Wiwatwarapan*, N. Areethamsirikul, S. Meekaw (Chulalongkorn University, Bangkok, Thailand).

This study examined the effect of Tom Yum soup on color change in 5 visible-light-cured composite resins (Z250, P60, Herculite XRV, Metafil C, Spectrum) and 2 polyacid-modified composite resin (Dyract AP, F2000), 6 specimens (h 1.2 mm, d 2 cm.) of each product were stored in distilled water at 37°C for 24 hours before baseline measurement, then soaked in 7 cm³ Tom Yum soup (Takrai®) at 50 ± 1 °C. Color measurement (L*, a*, b*) was made using a spectrophotometer after soaking time of 0, 6, 12, 24, 72, 168 and 336 hours. L*, a* and b* values were used to calculate ΔE. Mean values and standard deviation of ΔE in each time interval of each product were:

Product	Time (Hours)					
	0	12	72	168	336	
Z250	1.40±1.19	1.93±0.96	2.58±1.13	3.92±0.86	6.67±1.61	9.79±1.30
P60	2.74±0.29	3.25±0.22	4.43±0.32	6.43±0.47	8.60±0.49	10.95±0.47
Herculite XRV	1.18±0.78	2.50±0.83	1.82±0.97	3.10±0.89	4.80±1.26	6.78±1.12
Metafil C	0.83±0.21	1.69±0.47	0.80±0.11	1.01±0.14	1.13±0.22	1.24±0.61
Spectrum	1.38±0.23	1.88±0.30	1.57±0.22	1.68±0.22	1.96±0.23	2.67±0.43
Dyract AP	0.61±0.25	0.57±0.14	0.76±0.25	1.26±0.42	4.22±0.93	4.03±1.31
F2000	2.43±0.35	2.60±0.49	4.17±1.93	2.60±0.39	4.50±0.66	4.60±0.98

When the value of ΔE>3.5, it was considered to be clinically unacceptable (Fan P.L. Color and Appearance. In: O' Brian W.J., editor, Dental materials and their selection, second edition, Carol Stream: Quintessence Publishing Co, 1997: 29). P60 and F2000 were discolored at 24 hrs., Z250 at 72 hrs., XRV and Dyract AP at 168 hrs., but it has no effect on Metafil C and Spectrum after 336 hrs. of TomYum exposure. Supported by Dental research project 1997 Faculty of Dentistry, Chulalongkorn University.

P-17 Application of Novel MAC to Dentin Primer. N.NISHIYAMA*, K.NEMOTO (Nihon University School of Dentistry at Matsudo, Chiba, JAPAN)

In this study, the methacryloyloxy aliphatic carboxylic acids (MAC) with different methylene lengths (methylene number=1: O-methacryloyl glycolic acid, MGA; methylene number =2: 3-methacryloyloxy propionic acid, MPA) were synthesized for a dentin primer. The effects of the methylene number in the MAC molecule on the bond strength of resin to acid-etched dentin were examined. After the ground dentin of the bovine tooth was etched with 40% phosphoric acid for 15 s, the dentin surface was primed with MAC solution. Immediately thereafter, the bonding agent was applied and then the composite resin was adhered to the dentin surface. When the MAC primers were applied to the etched dentin, the bond strength of the resin to dentin increased dramatically from 5 MPa to 12 MPa (Scheffe's p<0.05). However, the application of thermocycling (10,000 times for each bath of 4 and 60°C for 1 min) decreased the bond strength of resin, even though the etched dentin was treated with the MACs. The decrease in the bond strength to the dentin primed with MGA was lower than that obtained with MPA. It is concluded that the synthesized MAC primers enhance the bonding at the resin-dentin interface and improve the hydrolytic stability of bond strength.

Table 1 The bond strength of resin to the etched dentin primed with MAC before and after thermocycling

	Before thermocycling	After thermocycling
Non-primer	5.0 (2.2)	1.6 (0.8)*
MGA primer	12.1 (3.7)	11.6 (2.1)
MPA primer	13.4 (3.1)	10.8 (2.6)

*Significant difference corresponded to the bond strength before and after thermocycling (Scheffe's p <0.05)

P-21 The Study of Tear Resistance of Silicone with Lipid Absorption. N. Thamrongananskul*, L. Boontham, W. Panichkriangkai and P. Phankosol (Department of Prosthodontic, Faculty of Dentistry, Chulalongkorn university, Thailand)

Silicone has been widely used as a maxillofacial prosthetic material since its properties simulate human soft tissues. However, skin contact and lipid absorption from skin might shorten the longevity of the material. This study was designed to evaluate the change of tear resistance of the silicone after lipid absorption. Four groups of 30 silicone specimens, 25 mm X75 mm X 1.5 mm. In size according to ASTM-D 1938-92. The groups included an untreated control group while the other three groups were immersed in lipid extracts from pigs, cattle and soybeans. All of them were incubated at 37 °C for 720 hrs. The specimens were tested for tear resistance as mean load. The data were collected and analyzed statistically by one way analysis of variance at α=0.05. The results showed that specimens immersed in cattle oil extract had significantly decreased tear resistance compared to control and pig oil extract groups. Soybean oil seemed to reduce tear resistance with no statistical difference. However, pig oil did not have any effect on tear resistance at all. The study was supported by a grant from Dental research project, Faculty of Dentistry, Chulalongkorn University 1999.

P-18 Microleakage of Class II Restorations Using SONICSYS⁴: An In Vitro Investigation. HOANG D.B.T.* and HOANG T.H. (Faculty of Odonto-Stomatology, HCM City, Vietnam).

SONICSYS⁴ (Kavo-Vivadent) is a direct restorative technique using sonically driven diamond-coated tips to prepare standardized cavities to receive prefabricated ceramic inlays. The aim of this study was to evaluate in vitro microleakage of Class II SONICSYS⁴ inlays using two different luting agents: a light-cured flowable composite (Tetric[®] Flow, Vivadent) with etching and application of bonding agent (Syntac[®] Single Component, Vivadent) and a self-cured resin-modified ionomer cement (Protec-CEM, Vivadent). 36 freshly extracted noncarious human permanent molars were prepared with the SONICSYS⁴ approx tips and then randomly divided into 2 groups of 18 each. Syntac[®] Single Component/Tetric[®] Flow, following etching was used in Group 1. Protec-CEM without etching in Group 2 to lute the ceramic inlays.

All specimens were stored in physiological saline at 37°C for 24 hours and thermocycled between 5°C and 60°C for 100 cycles, prior to 12 hour-immersion in 2% methylene blue dye. Microleakage was assessed under stereo microscope (x30) by 2 independent, calibrated evaluators according to the degree of dye penetration at cervical margins, on a 4-degree scale. The main results were as follows:

Score	0	1	2	3
Group 1	7	4	0	7
Group 2	2	1	1	14

0: no leakage
1: leakage no deeper than half of length of cervical box
2: leakage along the entire length of cervical box
3: leakage along axial walls

Group 2 showed significantly higher microleakage score than Group 1 (Mann-Whitney test p < 0.05). It was concluded that light-cured flowable composite (Tetric[®] Flow) with acid-etching and bonding is more effective in reducing microleakage under SONICSYS⁴ inlays than self-cured resin-modified ionomer cement (Protec-CEM).

P-22 The parameters of laser welding apparatus on penetration depth of cast c.p. titanium. C.C. Hsu, C.C. Hong*, M.S. Huang and H.H. Huang (Institute of Dental Materials, Chung Shan Medical & Dental College; Chungtai Institute of Health Sciences and Technology, Taichung, Taiwan.)

The purpose of this study was to determine optimal laser power parameters on cast c.p. titanium welding. Observation of the penetration depth and microstructure structure were evaluated under SEM. Three rectangular patterns 10 mm x 10 mm x 3 mm were prepared from hard pink base plate wax (Moyco Industries Inc., Philadelphia, PA) for each parameter. CP titanium (Grade II Ti, Pure Ti A, J. Morita Co., Osaka, Japan) was casted by using titanium casting machine (Cyclar II, J. Morita Co., Osaka, Japan). Before welding, the specimens were sandblasted with 50 micron Al₂O₃ to create dull surfaces. A Nd:YAG laser welding apparatus (LaserStar, Bego Co) was used for welding procedures and all of the laser welding procedures were done in an argon atmosphere. The conditions such as input voltage (290 ~400 Voltage), pulse duration (9~20 ms) and beam diameter (0.3 and 0.5 mm) were evaluated. Observation of the penetration depth, width and microstructure structure were examined under metallurgical microscope. A three-way ANOVA followed by a Student-Neuman-Keuls was used to analyze the data. There was statistically significant difference of welding depth and width between 0.3 mm and 0.8 mm beam diameter (p < 0.05). On 0.3 mm beam, there were statistically significant deeper penetration (p < 0.05) whenever input voltage was 320, 330 and 350 V under 9 ms. However, there were more voids created when input voltage was 350 V. On 0.8 mm beam, 400 V and 10 ms show significantly deeper penetration (1.4 ± 0.03 mm) than other parameters (p < 0.05). It is concluded that adequate parameter selection is necessary during the laser welding procedure to create adequate penetration depth and eliminate voids.

P-19 Biaxial Flexural Strength of Bovine Dentin and Castable Ceramics. H. TAKAHASHI*, F. NISHIMURA, T. INOUE, N. IWASAKI, H. KITAZAKI, F. NAKANO, K. TONAMI and M. YAN¹ (Tokyo Medical and Dental University, Tokyo, Japan and Chung Shan Medical & Dental College, Taichung, Taiwan¹)

Aesthetic restorations such as ceramics have been more popular because of increasing patient demands. The biaxial flexural strength (BFS) is commonly employed for evaluating mechanical properties of ceramics. However, the relation between the BFS of dentin and BFSs of ceramics have not been clearly confirmed. In this study, the BFS of dentin was measured in an effort to evaluate the BFSs of castable ceramics. Ten bovine dentin disks (12 mm/ diameter and 1.2 mm/ thickness) of the first mandibular incisor were prepared using an air-turbine with a diamond point and a low speed cutter. Ten disks (14 mm/ diameter and 1.2 mm/ thickness) of two castable ceramics (Crys-cera, Kyutai Denteram, Japan and OCC, Olympus, Japan) were prepared according to the manufacturers' instructions. The biaxial flexural test was performed using a universal test machine (1123, Instron, USA) at a crosshead speed of 1.0 mm/min, a piston diameter of 1.2 mm, and a support circle of 10.0 mm. Means ± S.D.s of BFSs of dentin, Crys-cera and OCC were 185 ± 31 MPa, 176 ± 22 MPa and 224 ± 62 MPa, respectively. BFSs of castable ceramics were not significantly different from BFS of bovine dentin using Scheffe's multiple comparison test (p<0.05).

P-23 Finite element analysis of four thread-form configurations in a stepped screw implant. J.P. Geng*, K.B.C. Tan, G.R. Liu and S.H. Teoh (National University of Singapore, Singapore)

An experimental stepped screw osseointegrated dental implant was designed for investigation and biomechanical optimization. The purpose of this study was to determine the optimal thread form configuration for an experimental stepped screw implant using two-dimensional finite element (FE) analysis. Four different thread form configurations were compared: v-thread (V), thin-thread (T), and two square-thread forms of 0.24 mm (S1) and 0.36 mm (S2) thread width. Four two-dimensional single stepped screw implants were modeled with similar conditions of thread number, position, height and pitch, in a standard two-dimensional cross-section of the posterior human mandible. The stepped screw implant was modeled in Unigraphics 2.0 and component geometry exported to MSC/PATRAN 8.5 for FEA meshing into 4-noded quadrilateral elements. In ABAQUS/Standard, an oblique load of 141 N at 45 degrees angle was applied to the top of the transmuscular abutment. Maximum von Mises stresses at cortical bone level and trabecular bone-implant interface were:

Max von Mises Stress (Mpa)	V	T	S1	S2
Cortical Bone	70.4	79.0	76.9	76.3
Trabecular Bone-Implant Interface	37.1	47.3	39.1	39.0

Only the thin-thread (T) model demonstrated significantly different stress distribution from the other 3 models. Maximum stress of approximately 20% higher in trabecular bone-implant interface compared to the other three implant models was seen. Stress distribution in cortical bone does not seem to be greatly influenced by thread form configuration. It can be concluded that both v-thread (V) and square thread form (S1 & S2) configurations appear to suitable for use in a stepped screw implant design but thin thread forms should be avoided.

P-24 Surface roughness and accuracy of titanium casting using gypsum-bonded investment. M.YAN*, F.NISHIMURA¹, H.TAKAHASHI¹ (Chung Shan Medical & Dental College, Taichung, Taiwan and Tokyo Medical and Dental University, Tokyo, Japan)
 We previously reported a gypsum-bonded investment for high-fusing casting such as titanium (YAN M et al, *Dent Mater J* 17:310-313, 1998). In the present study, we evaluated surface roughness and accuracy of titanium castings using the aforementioned experimental investment. This investment consisted of 20 mass% of alpha hemi-hydrate gypsum as a binder and alumina and magnesia powder as a refractory; the mass ratios of alumina and magnesia were 6:1; the investment was mixed with a 2 mass% K₂SO₄ solution at a W/P of 0.28. A trapezoid was pattern using a metal mold was prepared. The investment was heated to 1400 °C and cooled to room temperature. Five cp titanium castings and three Cu-Zn alloy castings for laboratory practice were cast using an argon arc melting casting machine (Vulcan-T, Shofu, Japan) and a conventional casting machine (TS3, Degussa, Germany), respectively. Five titanium castings employing a commercial investment for titanium (Titavest CB, Morita, Japan) were also performed according to the manufacturer's suggestions. Surface roughness (Ra) of castings was measured using a surface analyzer, and the accuracy of casting was calculated based on the dimensional change of the casting using the trapezoid pattern taper. Mean and S.D.s of Ra and accuracy of the casting were summarized as follows:

	Ti (experimental)	Ti (Titavest)	Cu-Zn (experimental)
Ra (µm)	9.3 (6.5)	1.7 (0.3)	8.2 (2.4)
Accuracy (%)	-0.05 (0.14)	1.56 (0.38)	0.21 (0.05)

The Ras of castings from the experimental investment were significantly greater than that from Titavest using Scheffe's multiple comparison test (p<0.05); however, the accuracies of the experimental investment were significantly better than that from Titavest. These results suggest that accuracy of titanium casting using the gypsum-bonded investment for high-fusing casting is acceptable; however, the surface roughness should be improved.

P-28 Antimicrobial Usage and Survival of Ankylos Implants to Post-loading. H F Morris*, S. Ochi. AICRG Investigators, Department Veterans Affairs, Dental Clinical Research Center, VA Medical Center, Ann Arbor, USA
 The benefit of antimicrobial use in implant surgery varies widely. Treatment efficacy has been reported in several clinical studies. Risks from inappropriate medical use of antibiotics are well documented. This paper reports on survival of the Ankylos implant associated with antimicrobial usage. 34 centers, over 70 dentists and 1,400 implants are included in this study: A recommended antibiotic regimen was provided as a guideline. The microbial treatment variables were included in a Cox regression to determine their effects on survival to prosthesis loading. Antibiotic regimens were pre-operative, infra-operative, and post-operative. The use of 0.12% chlorhexidine digluconate rinse at implant placement and uncovering was recorded. The American Heart Association (AHA) recommendation was used as the "effective dose" standard for pre-operative antibiotic use. The present study showed that survival was 97.4% pre-operative antibiotics and 98.1% without; with AHA recommendations followed, survival was 97.3% compared to 98.1% without; with infra-operative antibiotics survival was 97.0% compared to 97.6% without; post-operative antibiotics resulted in 97.4% survival with and 97.6% without. At implant placement, when chlorhexidine rinses were used, survival was 97.6% compared to 97.5% when not used; at uncovering, survival was 97.1% with and 98.8% without. Cox regression tabulations did not show that any of the antimicrobials had any significant effect on survival (p>0.05, Wald statistic). Antimicrobial use did not significantly improve survival for the Ankylos implant, and does not appear to be required with this implant design.

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P-25 Abrasivity and Particle Size of Toothpowder in Thailand. E. BENJAVONGKULCHAI*, S. TAMSAILOM (Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand)
 Toothpowder was first developed in ancient times long before toothpaste. Nowadays it no longer exists in some countries. However, it still has substantial popularity in the some Southeast Asian countries including Thailand. There are several brands of toothpowder in supermarkets in Bangkok. Despite its long and continuous use in the country, the knowledge of its properties is very limited. Most dentists will not recommend their patients to use toothpowder since they fear its abrasivity on tooth surface. The objectives of this study were to investigate the abrasivity and particle size of toothpowder sold in Thailand. Seven brands of Thai toothpowder, ie. Bella Salt, Boon Niyom, Roong Aroon, Supaporn, Thip Niyom, Thone Prajak and Wisade Niyom were tested for relative dentin abrasion (RDA) and relative enamel abrasion (REA) using the radioisotope method as recommended by International Standard Organization (ISO). The particle size was measured using sieving machine. The abrasivity data was analyzed using one way ANOVA and Tukey analysis while particle size data was analyzed using Wilcoxon Signed Ranks test. It was found that toothpowder brands with the highest RDA and REA were Thip Niyom and Thone Prajak, respectively. Bella Salt and Boon Niyom had the lowest RDA and REA, respectively. The mean particle size among the samples was significantly different. Thip Niyom had the largest particle size (451.06 µm) whereas Boon Niyom the smallest size (165.16 µm). There was a correlation between particle size and RDA (r = 0.525) and between particle size and REA (r = 0.747). All brands of toothpowder studied have RDA and REA within the values of ISO and TISI (Thailand Industrial Standards Institute) but their particle sizes are bigger than the values recommended by TISI. This study was supported by Faculty of Dentistry Research Fund, Chulalongkorn University.

P-29 Use of Titanium Mesh for Bone Grafting - a Pilot Study. K.H. Teoh* and W.K.S. Tan (*Department of Restorative Dentistry, NDC, Singapore and Department of Oral and Maxillofacial Surgery, NUS, Singapore).
 The macroporous Titanium Mesh (Ti Mesh) has been used for fracture fixation, treatment of non- or malunions of the jaws and reconstruction of both the maxilla and mandible (Boyne, 1994). The aim of the pilot study was to investigate the effectiveness of Ti Mesh in bone grafting alveolar bone defects for implant placement. Ten consecutive patients with bony defects requiring bone-grafting procedures for endosseous implants were studied. All grafting procedures were staged and separate from the implant placement operation. Preoperative data on the etiology of tooth loss, location and defect size estimates were collected. Relevant medical history, age and gender were also obtained. All the defects were filled with autogenous / mixed bone grafts from iliac crest or intra-oral sites. On implant placement, recording was made of the need for further grafting and complications, which arose from the Ti Mesh grafting procedure. The subjective quality of bone and the duration of the graft under the mesh were also noted. In only one case, a second bone graft was required. The subjective bone quality in all restored cases was deemed suitable for implant placement. Certain precautions in the placement bone grafts under the mesh will be elaborated upon, together with the limitations of this study. In conclusion, preliminary findings indicate the Ti Mesh technique is effective in reconstructing alveolar bone for implant placement. A more elaborate study with objective quantitative and qualitative parameters is required to evaluate its stability in the long-term.

P-26 Stability assessment of the implant-bone interface using natural frequency analysis. Chung-Lia Chiu¹, Kang-Hsin Fan¹, Sheng-Yang Lee^{2,3}, Haw-Ming Huang¹, Li-Chern Pan¹. ¹Graduate Institute of Oral Rehabilitation Sciences, ²Dental Department of Wan-Fang Hospital, ³School of Medical Technology, ⁴School of Medical, Taipei Medical College, Taipei, Taiwan
 After functional loading, dental implant often subjects to progressive changes on marginal height with time. Especially, the effects of overloading and inflammation will cause rapid margin-bone-height loss, along with changes of bone density and thickness. Therefore, it is important to develop an immediate and noninvasive examination tool for the evaluation of dental implant in clinical practice. Current study will investigate the relationship between changes in natural frequency and marginal conditions, by plaster embedding method and simulate the variation of boundary condition during the remodeling processes. Our result showed that: (i) Natural frequency decreased with the reduction in marginal heights. Also, when the decrement of marginal height was more than 3mm, there was significant decreasing tendency in natural frequency, irrespective with changes in marginal thickness and density. (ii) For any boundary height, natural frequency would increase with marginal thickness and density increasing for different embedding materials. (iii) For any boundary density, as boundary thickness decreased the change rate in natural frequency with boundary heights became less prominent. (iv) There was a linear relationship between boundary height and natural frequency. For denser embedding plaster, natural frequency would more sensitive to changes in marginal heights. It thus concluded that nature frequency would be an alternative way to measure changes in marginal height, thickness and marginal density for dental implant. However, due to individual differences, before any clinical application it is highly suggested to measure quantitatively the relative change in frequency values under different boundary conditions for each individual.

P-30 Biocompatibility of Poly-L-lactide and Hydroxyapatite Composite Y-J Bai¹, S-Y Lee¹, W-J Chang¹, C-Y Wang², Y-H Wang³, B-R Guo, H Tseng⁴, C-T Lin¹ (¹Graduate Institute of Oral Rehabilitation Sciences, ²Department of Microbiology and Immunology, Taipei Medical College, Taipei, Taiwan.)
 Poly-L-lactide (PLLA) is bioresorbable, has high strength and can be used as a osteosynthesis material. However, PLLA with a high molecular weight over 5*10⁶, was difficult to make, resulting in limited mechanical properties and insufficient application. A low-molecular-weight (2*10⁵) PLLA, therefore, was used to make a new PLLA/hydroxyapatite (HA) composite with high bending strength of 120 MPa in a previous study. In this study, such PLLA/HA composite was investigated its biocompatibility and co-cultured with human gingival fibroblasts for 24 hours. And the cell growth rates were determined by MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) assay. The pure PLLA and HA were used as the control, respectively. The histological study was also examined after the implantation of the PLLA composite from 24 hours to 35 days. The results showed that cell growth rate in the PLLA composite group were higher than that of the PLLA group and equivalent to that of HA group. The fibroblasts attached to PLLA/HA composite were observed. The histological data also showed inflammation phenomenon in the early stage and fibrosis after 14 days. The results indicated the PLLA composite has good biocompatibility *in vivo* and *in vitro*.

P-27 Patient Satisfaction with Ankylos Implant-Supported Prosthesis. S. Ochi¹, H.F. Morris, AICRG Investigator, Department Veterans Affairs, Dental Clinical Research Center, VA Medical Center, Ann Arbor, USA
 Patient satisfaction with implant-supported or retained dental prostheses may be influenced by many factors related to both the clinical settings where treatment is provided or patient characteristics. This large-scale clinical study provides an opportunity to assess responses received from patients in many clinical settings involving a variety of clinicians and dental clinics. This paper reports on the response of patients to their treatment six months after the insertion of the Ankylos supported/retained dental prosthesis. This study includes 34 centers, over 70 dentists and 1,400 implants were placed and restored in 530 patients. Patients receive as many as four cases with 1-12 Ankylos implants for support/retention of the prosthesis. These prostheses were provided for all quadrants. Past medical and dental histories were recorded as part of treatment planning. Responses to a questionnaire by 189 patients, 6-months following prosthesis placement, were recorded, analyzed and compared with responses prior to and after treatment with Ankylos implants. The present study showed that the patients were highly satisfied with their implant supported/retained dental prostheses. After placement of the Ankylos implantsupported/retained prosthesis, 59.4% of the patients rated their "new chewing ability" as excellent (82/138), 34.8% as good (48/138), while only 5.7% (8/138) indicated only fair improvement. When comparing their Ankylos-supported/retained prosthesis with their current ability to chew foods, 84.1% (116/138) indicated that it was "greatly improved". Almost all patients (99.3% = 1/138) indicated that they liked their "new teeth". This large clinical study provided a unique opportunity to assess some patient-related factors associated with patients' responses to Ankylos-supported/retained dental prostheses. Patient satisfaction with Ankylos-supported/retained dental prostheses was good.
 Supported by DEGUSSA-HULS-AG, Conducted by Department of Veterans Affairs.

P-31 High-performance Polyethylene Woven Fabric Reinforced Denture - Impact Resistance and Fabrication Y.Y. Cheng* and T.W. Chow (Faculty of Dentistry, University of Hong Kong)
 This study was made to investigate the impact resistance of denture base acrylic resin reinforced with high-performance polyethylene woven fabric, and to develop a modified conventional dental laboratory dough molding technique for the incorporation of the multiple layers of woven mats into complete denture bases. Specimens (80 x 12 x 2.5 mm) of acrylic denture base resin (Trevalon) reinforced with 1, 3, 5, and 10 layers of woven fabric were fabricated by a split-pack technique and tested with Zwick 5101 pendulum impact tester. The impact strengths, kJ/m², of the specimens are as follows: nonreinforced PMMA: 10(1); reinforced PMMA with 1, 3, 5, and 10 layers of woven fabric: 16(5), 37(11), 57(17) and 61(18), respectively (SD in brackets). The incorporation of woven fiber mats into the denture base resin significantly enhanced the impact strength, which was as much as six times greater than that of the nonreinforced specimens (ANOVA, p<0.05). Besides, the fiber reinforced fragments remained coherent when damaged during impact. This typical property provides a safety feature for denture wearers by reducing the risk of inhalation of broken denture fragments in the event of an accident. The split-pack technique was successfully employed to fabricate maxillary and mandibular dentures reinforced with 1, 3, 5, and 10 layers of woven fabric. A recess was formed in the resin by means of a spacer to allow the reinforcement to be embedded in the denture base without exposing the fibers. The translucent neutral-colored fibers do not alter the esthetics of complete dentures, and therefore the reinforced complete dentures were readily accepted by patients. Reinforced denture base resin with polyethylene woven fabric showed dramatic improvement of impact strength, and complete dentures reinforced with multi-layers of woven fabric can be fabricated using a simple split-pack technique. In addition, reinforced dentures reduce the risk of inhalation of broken fragments in the event of an accident.

<p>P-32 Adverse Effects of Arecoline and Nicotine on Human Periodontal Ligament Fibroblasts. Y. C. Chang*, K. W. Tai, M. Y. Chou. (Institutes of Stomatology, Chung Shan Medical and Dental College, Taichung, Taiwan)</p> <p>The habit of areca quid chewing impinges on the daily lives of approximately 200 million people. Areca quid chewers have a higher prevalence of periodontal diseases than non-chewers. This study examined the pathological effects of arecoline, a major component of the areca nut alkaloids, on human periodontal ligament fibroblasts (PDLF) <i>in vitro</i>. Cell viability, proliferation, protein synthesis, and cellular thiols levels were used to investigate the effects of human PDLF exposed to arecoline levels of 0 to 200 µg/ml. In addition, nicotine was added to test how it modulated the effects of arecoline. Arecoline significantly inhibited cell proliferation in a dose-dependent manner. At concentrations of 10 and 30 µg/ml, arecoline suppressed the growth of PDLF with 20% and 50% ($p < 0.05$), respectively. Arecoline also decreased protein synthesis in a dose-dependent manner during a 24 h culture period. A 100 µg/ml concentration level of arecoline significantly inhibited the protein synthesis to only 50% of these in the untreated control ($p < 0.05$). Moreover, arecoline significantly depleted intracellular thiols in a dose-dependent manner. At the concentration of 25 µg/ml and 100 µg/ml, arecoline depleted about 18% and 56% of thiols ($p < 0.05$), respectively. This suggests that arecoline itself might augment the destruction of periodontium associated with areca nut use. Furthermore, the addition of nicotine acted with a synergistic effect on the arecoline-induced cytotoxicity. At a concentration of 60 µg/ml, arecoline suppressed the growth of PDLF about 33% and 5 mM nicotine enhanced the arecoline-induced cytotoxic response to cause about 66% cell death. During thiols depletion, arecoline may render human PDLF more vulnerable to other reactive agents within cigarettes. Taken together, people who combine habits of areca nut chewing with cigarette smoking could be more susceptible to periodontium damage than areca nut chewing alone.</p>	<p>P-36 Connective tissue and bacterial deposits on rubber dam barrier membranes W. APINHASMIT*, S. SWASDISON, S. TAMSAJLON and N. SUPPIPAT (Faculty of Dentistry, Chulalongkorn University, Bangkok 10330, Thailand)</p> <p>The objective of this study was to compare the connective tissue and bacterial deposits on the lesion-facing surface of the rubber dam sheet with those on the e-PTFE membrane used as barrier membranes in the guided tissue regeneration (GTR). Eighteen patients affected by chronic periodontitis were treated by GTR technique with either the rubber dam sheet or the e-PTFE membrane as the barrier membrane. Four to six weeks after the first operation, the membranes were retrieved and examined by scanning electron microscopy for the presence of connective tissue and bacterial deposits. The results showed that numerous fibroblasts with their secreted extracellular matrices, known as components of connective tissue were scattered on these membranes. There was no significant difference in the total amount of the connective tissue on both the rubber dam sheet and the e-PTFE membrane ($p = 0.274$). In addition, many bacterial forms including cocci, bacilli, filaments and spirochetes with an interbacterial matrix were identified. The bacterial amount observed was less on the surface of rubber dam sheet than that on the e-PTFE membrane ($p = 0.008$). <u>The comparable ability of connective tissue to deposit on both membranes suggested that the rubber dam sheet interacts to the human tissue with similar result to the e-PTFE membrane. Therefore, the rubber dam sheet can be used as a barrier membrane in GTR.</u></p> <p>This study was supported by the National Metal and Materials Technology Center, the National Science and Technology Development Agency of Thailand, grant MT-B-06-3D-09-101 (to S.S.)</p>
<p>P-33 Stimulatory effect of fluoride on gingival fibroblast is serum dependent. K. CHAROONPATRAPONG, D. METHATHARATHIP, P. PAVASANT* (Department of Anatomy, Faculty of Dentistry, Chulalongkorn University, Thailand)</p> <p>Fluoride is an agent widely used to prevent dental caries either systemically or topically. In addition to this preventive effect, fluoride also affects cell proliferation and matrix synthesis in some cell types. In this study, we would like to clarify the effect of fluoride on human gingival fibroblasts. Human gingival fibroblasts were obtained from normal human gingiva and cultured in the presence of 0.1, 1, and 10 ppm of sodium fluoride. The result indicated that, in serum free condition, fluoride had no effect on cell proliferation. However, when tested in the presence of 1% serum, all three doses of fluoride used significantly stimulated cell proliferation from 2-2.4 fold, as judged by both ^3H thymidine incorporation and methylene blue assay. Furthermore, by using Western and dot blot analyses, these concentrations of fluoride were found to have also stimulated both fibronectin and collagen type I synthesis when tested in the presence of serum. <u>This observation indicates the influence of fluoride on gingival fibroblast behavior, however, the effect of fluoride requires the presence of serum.</u> Either fluoride acts directly on cells or enhances the effect of serum in this observation requires further investigation.</p> <p>This project is granted by Ratchadaphisek Somphot Endowment, Chulalongkorn University.</p>	<p>P-37 A study of tissue integration of porcine dermal collagen membrane Chang-Yu Lee¹, Hsein-Kun Lu², Ming-Fang Wu^{1*} (Taipei Medical College Dental School, ²Graduate Institute of Oral Rehabilitation Science, ³National Taiwan University College of Medicine, Animal Center Research Room)</p> <p>The purposes of this study were to study the phenomenon of tissue integration of porcine dermal collagen membrane (PDCM) <i>in vivo</i>. In this study, 3% GA-PDCM was implanted in the upper jaw of 20 Wistar rats. The specimens were harvested from each 2 rats 1, 2, 3, 5, 7, 10, 14, 21, 28, and 42 days after the surgery. The specimens were frozen immediately and processed for immunohistochemical stain (ABC method) to localize the distribution of integrin α_2, integrin α_4, integrin α_6, β_1, fibronectin. The results indicate positive reaction of integrin α_2, integrin α_4, and fibronectin in the specimens during all the period of this study. On fourteenth days, there were obvious positive reaction of integrin α_6, β_1. 3%GA-PDCM starts to achieve neovascular formation on the day of fourteenth. There were no significant pathologic reaction and evidence of tissue damage. In conclusion, these results indicated that PDCM possesses a good quality of tissue integration with adjacent connective tissue. PDCM fulfills the requirement of tissue integration in guided tissue regeneration. (NSC 88-2314-B-038-138)</p>
<p>P-34 Collagen I upregulates osteopontin expression in cultured periodontal ligament fibroblasts. T. DARONGSUWAN*, P. PAVASANT (Department of Anatomy, Faculty of Dentistry, Chulalongkorn University, Thailand)</p> <p>Osteopontin (OPN) is a highly phosphorylated protein expressed in mineral tissues. Expression of OPN has been used as one of the phenotypic marker for mineral forming cells. In this work, we have investigated the correlation between collagen type I and the expression of OPN in human periodontal ligament (HPDL) fibroblasts and human gingival (HG) fibroblasts. HPDL and HG fibroblasts were obtained from healthy tooth extracted for orthodontic reason and grown on the culture dishes coated with 10 µg/cm² of rat tail collagen type I (test) or the vehicle (control). RT-PCR analysis was performed to analyze the expression of OPN after 3 days of culture. The results showed the upregulation of OPN mRNA in HPDL fibroblasts when cultured on the collagen matrix as compared to the control. No difference has been observed in HG fibroblasts in both control and experimental groups. <u>These results indicate the correlation between collagen type I and OPN in periodontal ligament fibroblasts,</u> however, the significance of this correlation remain to be investigated through further study.</p> <p>This project is granted by Ratchadaphisek Somphot Endowment, Chulalongkorn University.</p>	<p>P-38 Silicone sheet as barrier membrane: <i>In vitro</i> and clinical studies SWASDISON S*, APINHASMIT W, SUKHONPAN C, CHAYAVIVATTANAVONK S. (Faculty of Dentistry, Chulalongkorn University, Bangkok 10330, Thailand)</p> <p>The objective of this study is to investigate the biocompatibility of the silicone sheet to human cells and to introduce it as a barrier membrane in the treatment of periodontal disease by guided tissue regeneration. By utilizing the cell culture technique and MTT assay, we found that human gingival fibroblasts were able to grow and proliferate in the presence of the silicone sheet. Microscopically, the cells attached well on the surface of the sheet. The silicone sheets were then clinically used as barrier membranes in 9 patients with more than 6 months follow up. The results showed that the wound healing was satisfactory with new bone formation and decreasing in pocket depth, even though the gingival recession was observed. <u>These results suggested that the silicone sheet is biocompatible to human gingival tissue and can be used as a barrier membrane in the guided tissue regeneration.</u></p> <p>This study was supported by The National Materials Technology Center, The National Science and Technology Development Agency of Thailand, grant MT-B-06-3D-09-101 (to S.S.).</p>
<p>P-35 Interleukin-6 and inducible cyclooxygenase gene expression in rat pulpitis and their differential regulation by IL-1α and TNF-α through prostaglandin-dependent and -independent mechanisms in dental pulp fibroblasts</p> <p>Sze-Kwan Lin¹, Mark Yen-Ping Kuo¹, Jih-Jong Lee², Juo-Song Wang¹, Li-Deh Lin¹, Tong-Mei Wang¹, Chih-Chiang Wang¹, Chi-Yuan Hsueg¹</p> <p>Department of Dentistry¹, Department of Veterinary Medicine², Graduate Institute of Clinical Medicine³, National Taiwan University, Taiwan</p> <p>Increased level of inducible cyclooxygenase (COX-2) and interleukin-6 (IL-6) are related with several inflammatory status. In this study, the effects of IL-1α and TNF-α, either alone or in combination with prostaglandin E₂ (PGE₂), on dental pulp fibroblast IL-6 and COX-2 mRNA production were investigated. Modulating roles of PGs on these cytokine-triggered reactions were also studied. The sequential IL-6 and COX-2 gene expression in pulpitis were examined by <i>in situ</i> hybridization. The increased expression of IL-6 and COX-2 genes were time-dependently as pulpitis progressed and were detected primarily in fibroblasts and macrophages. IL-1α and TNF-α induced pronounced IL-6 (-3.4- to -10.4-fold) and COX-2 (-5- to -6.2-fold) gene expressions. PGE₂ suppressed the IL-1α or TNF-α-induced IL-6 gene expression ranging from 45% to 65%. Indomethacin markedly enhanced the stimulatory effects of IL-1α or TNF-α on IL-6 mRNAs synthesis and these effects could be reversed by exogenous PGE₂. In contrast, PGE₂ or indomethacin, however, failed to modify the cytokine-induced COX-2 gene expression. These data suggested the involvement of pulp fibroblasts in the pathogenesis of pulpitis. IL-6 and COX-2 gene expressions in this type of cells were differentially regulated by cytokine through PG-dependent and -independent pathways separately. The downregulation of PGE₂ on cytokine-induced IL-6 mRNA synthesis also implied the protective role of COX-2 during pulpitis.</p>	<p>P-39 A Case Study of Gingival Fibromatosis in a Proband with Periodontal Disease S.M. San Miguel*, E. Sugiyama, S. Hagiwara, I. Ishikawa (Tokyo Medical and Dental University, Tokyo, Japan)</p> <p>Gingival fibromatosis is a rare benign oral disease with unknown etiological factors resulting in gingival enlargement. Our report describes the nature of gingival enlargement of a male proband afflicted with periodontal disease. Intraoral and radiographic examinations, blood and serum antibody titer tests, microbiological and cytogenetic analyses were done to further confirm the nature of the disease process. The pedigree of the proband's family was also analyzed to supplement these examinations. The result of the intraoral examinations revealed that the gingival enlargement was non-hemorrhagic, dense, fibrous, and had a stippled surface with normal color. There was a localized bone resorption in the molar areas as observed in the radiograph. Blood tests were within normal levels except for an increased serum IgM level. Pedigree analysis showed that the father, his unmarried brother and only sister was affected with gingival fibromatosis. The daughters of his sister had also exhibited a mild form of gingival fibromatosis. Those who were not affected were his mother and the two married brothers. However, the children of his brothers showed a pronounced gingival enlargement. Cytogenetic studies revealed no abnormality in the short arm of number 2 chromosome. <u>The findings indicated that the proband was suffering from a localized form of periodontitis and the mode of transmission of the gingival fibromatosis in this pedigree was autosomal dominant inheritance.</u></p>

P-40 Anti-adherence Properties of Aqueous Extracts of *Piper* sp. and *Psidium* sp. on Whole Plaque Bacteria *FATHILAH, A.R., OTHMAN, Y., YUSOFF, M. and RAHIM, ZHA. (University of Malaya, 50603 Kuala Lumpur)

Plaque is a major contributing factor in the initiation of caries and periodontal diseases only when it is thick and left uncleaned over a period of time. If the oral cavity is regularly cleaned and plaque layer is kept at its minimal thickness, plaque would not be of any risk to the host. Instead, it will act as a protective barrier against the colonization of potential pathogens to the tooth surface. In the early stage of plaque formation, bacteria colonise the tooth surface by selectively adhering to the salivary components found covering the tooth surface. The presence of these early colonizers plays a very important role as it provides additional adhesion of other bacteria taking part in the development of dental plaque. Aqueous extracts of two local plants (*Piper* sp. and *Psidium* sp.) have been shown to have growth inhibiting effect on isolated plaque bacteria. In this study, the influence of the extracts on the adhesion of plaque microorganisms on a glass surface was determined. The internal surfaces of a glass tube were coated with saliva to simulate the pellicle-coated enamel surface in the oral cavity. The tubes were then treated with the plant extracts prior to the addition of the plaque culture. The suspension was incubated at 37°C for 18-24 hours, followed by the reading of the optical absorbance at 550nm. The anti-adherence effect was determined by the difference in the binding capacity of the bacterial cells the saliva-coated glass surfaces without and with treatment. Response of the whole plaque microorganisms to chlorhexidine treated saliva-coated tubes acted as a positive control while untreated saliva-coated tube as a negative control. In addition, the effect of the extracts on the whole plaque microorganisms were also observed under the scanning electron microscope (SEM). **Results obtained showed the aqueous extracts of *Piper* sp. and *Psidium* sp. inhibit the adherence of plaque microorganisms to the glass surfaces by 78% and 43% respectively. Ultrastructurally, as seen under SEM, both extracts were shown to aggregate the bacterial cells.**

P-44 Full-mouth disinfection versus one-stage full-mouth mechanical debridement in the management of Adult Periodontitis - Clinical results. KOSHY G.* CORBET E.F., LEUNG W.K., JIN L.J. (Faculty of Dentistry, University of Hong Kong)

The novel idea of full-mouth disinfection, a full-mouth oriented approach in the treatment of periodontal infections, was suggested by Quirynen *et al.* in 1995. This treatment approach aims to eliminate / reduce the periodontopathogens colonising other intra-oral niches in addition to those colonising periodontal pockets. Full-mouth disinfection comprises full-mouth mechanical debridement within 24 hours along with subgingival irrigation of Chlorhexidine gel, disinfection of the dorsum of the tongue and rinsing with Chlorhexidine mouthwash during the healing period. This randomised, single-blinded, controlled, parallel study was to determine whether full-mouth disinfection confers any additional benefit over a one-stage full-mouth mechanical debridement in the treatment of adult periodontitis. 32 otherwise healthy, non-smoking patients, aged 35 to 60 years (mean 46.2 ± 7.54) having at least 2 sites with probing pocket depth (PPD) ≥ 5mm in each quadrant, participated in the study. The subjects were randomly divided into two groups: test group (n=16) and control group (n=16). The test group received full-mouth disinfection. The control group underwent debridement of all teeth in a single visit, but without use of Chlorhexidine at any stage, and received repeated personal oral hygiene instructions. Clinical measurements including: plaque percentage (PI%), bleeding on probing percentage (BOP%), PPD and probing attachment level (PAL), using a Florida Probe®, were recorded at baseline, 1 month, 3 months and 6 months. Statistical analysis was performed by both paired and unpaired t-tests and analysis of variance (ANOVA) for repeated measures. There were significant reductions in the PI% ($p<0.0001$), BOP% ($p<0.0001$), mean PPD ($p<0.0001$) and mean PAL ($p<0.05$) for both groups compared to baseline at all post-treatment evaluations. The test group in comparison to the control group showed greater reductions in PI% (55% vs 26.3%, $p<0.0001$), BOP% (58.6% vs 44.5%, $p<0.05$) and mean PPD (0.85mm vs 0.65mm, $p<0.05$), at 1 month. However no significant differences were noted between test and control groups at either 3 months or 6 months. ANOVA for repeated measures revealed that there were significant differences between groups for the PI% and BOP%. **This study indicates that full-mouth disinfection may confer some additional short-term clinical benefits over a one-stage mechanical debridement in the management of adult periodontitis.**

P-41 The Efficacy of an alcohol-free 0.12 % w/v Chlorhexidine Gluconate mouthwash (Oradex®) SWAMINATHAN, D*, UMA, S Faculty of Dentistry, University of Malaya, Kuala Lumpur, Malaysia.

Chlorhexidine gluconate, a dicationic bisguanidine agent, contains anti-plaque properties and has undergone thorough research in the past few decades. Most chlorhexidine gluconate mouthwashes presently available contain alcohol in varying concentrations. The role of alcohol in these mouthwashes is to act as a preservative and solvent although it may have deleterious effects on the oral epithelium on long term usage. Alcohol is also religiously unacceptable to some segments of the population. Recently, a locally produced alcohol-free 0.12% w/v chlorhexidine gluconate mouthwash (Oradex) has become available in Malaysia. This double-blind, crossover clinical study was aimed at testing the efficacy of this alcohol-free product compared to a placebo without the active ingredient chlorhexidine gluconate. A group of 60 carefully screened subjects were assigned into two groups of 30 each. The first group started using the test product for 2 weeks followed by a washout period of 4 weeks. After this period, this group used the placebo for 2 weeks. The 2nd group underwent similar protocol as the 1st except that this group started with the placebo. Baseline measurements consisting of the following scores: Plaque (Quigley-Hein with Turesky modification Index), Gingival (Loe & Silness Index), Papillary bleeding (Saxer & Muhlemann Index), Stain (Shaw & Murray Index) and Calculus (Volpe-Manhold Index) were recorded at baseline and after 2 weeks for each group. Full mouth prophylaxis was carried out for all subjects after baseline measurements. Each subject was provided with a standard toothbrush and toothpaste and instructed to continue with their routine, unsupervised oral hygiene. They were told to rinse with 15ml of the products twice daily for 30 seconds each. The results of the study indicated that there was significant improvement in the plaque ($p<0.05$), gingival ($p<0.05$) and papilla bleeding ($p<0.05$) scores compared to the placebo. Stain and calculus scores were significantly increased ($p<0.05$) for the test product when compared to the placebo, which was anticipated with this dicationic anti-plaque agent. The results of this study was comparable to several other studies on chlorhexidine gluconate mouthwashes of similar concentrations and containing alcohol. **In conclusion, this clinical study showed that this alcohol-free 0.12 % w/v chlorhexidine gluconate mouthwash is effective in reducing plaque and gingivitis but causes staining and calculus formation.**

P-45 *In vivo* investigation of the resonance frequency of natural tooth Mao-Sheng Wang*, Kang-Hsin Fan, Haw-Ming Huang¹, Sheng-Yang Lee^{1,2}, Ching-Ying Yeh¹, Che-Tong Lin¹, Li-Chem Pan¹, ¹Graduate Institute of Oral Rehabilitation Sciences, ²School of Medical Technology, ³Dental Department of Wan-Fang Hospital, School of Medicine, Taipei Medical College, Taipei, Taiwan

Periodontal Probe and radiographic examination are commonly used in the diagnosis and detection of periodontal disease. Unfortunately, these methods can not provide precise quantity data, which can lead to misinterpretation. The purpose of this study is to evaluate the possibility of using a new method to examine the attachment loss of periodontal tissue in terms of natural frequency. Central incisor, canine, first premolar and first molar were chosen to test *in vivo*. Modal testing method was carried out to evaluate periodontal disease and verified with the conventional method of attachment loss measurements. The current experiment implies that there is no obvious difference of the natural frequency of upper, lower, left and right teeth, but instead, it shows a difference in natural frequency between the anatomical structure of teeth in periodontal disease. Our results demonstrated that the mean value of the frequency is 1.26±0.1 kHz while the periodontium was diseased, which was significantly lower ($P<0.01$) than the teeth with healthy periodontium (1.34±0.18 kHz). On the other hand, the mean for diseased posterior teeth is at 1.22±0.13 as compared to healthy posterior teeth at 1.27±0.18 ($P<0.05$). **The result of the experiment implies that the use of natural frequency analysis is an effective way of determining the periodontal condition of teeth. Moreover, it can offer a fixed quantity, non-invasive, non-destructive and minimum contact method for early testing and prevention of periodontal disease.**

P-42 Full-mouth disinfection versus one-stage mechanical debridement in the management of Adult Periodontitis - Microbiological morphotype monitoring. CORBET E.F.*, KOSHY G., LEUNG W.K., JIN L.J. (Faculty of Dentistry, University of Hong Kong)

Full-mouth disinfection is a treatment approach which aims to eliminate / reduce periodontopathogens colonising other intra-oral niches in addition to those colonising periodontal pockets. The aim of this study was to determine the effects of a full-mouth disinfection approach using topical and locally delivered Chlorhexidine along with mechanical periodontal therapy on the subgingival microflora and to compare these with the effects of a one-stage mechanical debridement. 32 otherwise healthy, non-smoking adult periodontitis patients, aged 35 to 60 years (mean 46.2 ± 7.54), having at least 2 sites with probing pocket depth (PPD) ≥ 5mm in each quadrant, participated in the study. The subjects were randomly divided into two groups: test group (n=16) and control group (n=16). The test group received full-mouth disinfection. The control group underwent debridement of all teeth in a single visit and received repeated personal oral hygiene instructions, but without use of Chlorhexidine at any stage. Plaque samples were collected from the deepest pockets in each quadrant using sterile paper points at baseline, 1 month, 3 months and 6 months. These samples were silver-stained for microbiological analysis according to the method suggested by Coffey *et al.* (1995). Different microbial morphotypes were identified by light microscope at X 1000. Statistical analysis was performed by t-tests and by analysis of variance for repeated measures. In response to the treatments there were significant shifts in the subgingival microbiota from pathogenic to beneficial morphotypes in both groups. At 1-month, significant reductions in the proportions of spirochetes, from 52.7% to 9% ($p<0.0001$) in the test group and 53.7% to 15.2% ($p<0.0001$) in the control group, were observed. The proportions of spirochetes and curved rods was reduced further at 3 months but relaxed slightly by 6 months, however these proportions were still within "healthy" limits and statistically significantly reduced from baseline levels. A concurrent rise in the proportions of coccoid cells was noted which was also significantly different to baseline ($p<0.0001$). There were no significant differences between the two groups regarding the proportions of spirochetes or cocci at any time point of the study. **This morphological monitoring of subgingival plaque samples demonstrated no benefit from the application of a full-mouth disinfection approach compared to a one-stage mechanical debridement of the teeth.**

P-46 Vibration assessment of the periodontal conditions by finite element method Chiu-Chieh Yu¹, Haw-Ming Huang¹, Sheng-Yang Lee^{1,2}, Li-Chem Pan¹, Che-Tong Lin¹, Graduate Institute of Oral Rehabilitation Sciences, ²School of Medical Technology, ³Dental Department of Wan-Fang Hospital, School of Medicine, Taipei Medical College, Taipei, Taiwan

The aim of this study was to develop a new non-destructive, less time-consuming and more reliable method for detecting the attachment level around teeth. Natural frequency analysis was evaluated to achieve these goals. A 3-D finite element model of upper central incisor was carried out to simulate the periodontal disease as well as the alveolar bone quality in clinical oral practice. A 3-dimensional finite element model was established. This model consisted of enamel, dentin, pulp, periodontal ligament and alveolar bone. To simulate periodontal attachment loss, alveolar bone was lowered apical from C.E.J. in 1mm steps down up to 10mm. The bone quality was decreased from 100% to 10%. The natural frequencies of the model were calculated under the various boundary conditions. The natural frequency of upper central incisor with healthy attachment and bone level was 4700 Hz. Our results showed that natural frequency decreased significantly with lowering the attachment level. On the other hand, the bone density also affected the tooth's natural frequency. Similar results demonstrated that the frequencies also decreased linear with bone density. **Our results suggested that natural frequency is an important parameter for assessing the periodontal conditions. The results obtained by this study may become a useful reference for future clinical investigations.**

P-43 Polyphasic Characterization of *Mogibacterium* Species Isolated from Human Oral Cavities S. E. POCO, JR.*^{1,2}, F. NAKAZAWA¹, M. SATO¹ & E. HOSHINO¹ (Oral Microbiology, Niigata University Faculty of Dentistry, Japan¹ and Oral Medicine, University of the East, College of Dentistry, Philippines²)

The aim of the study was to describe the characteristics of the recently proposed genus *Mogibacterium* by a polyphasic approach. Members of the genus are asaccharolytic, anaerobic, Gram-positive rods (AAGPR) primarily isolated from periodontal pocket, necrotic pulp and tongue plaque. There are five recognized species, namely, *M. pumilum*, *M. vescum*, *M. timidum* (basonym *Eubacterium timidum*), *M. diversum* and *M. neglectum*, which produced phenylacetate as a sole metabolic end product from PYG. They were culture-difficult and inert in most conventional biochemical tests. The protein profiles on SDS-PAGE and RFLP analysis of PCR-amplified 16S rDNA distinguished these organisms from the type strains of other bacterial species. DNA-DNA hybridization values between *Mogibacterium* species ranges from 17-97%. The 16S rRNA gene sequence analysis demonstrated that these isolates are genealogically highly related (<90% sequence similarities) but each represent novel lineages. Comparative 16S rRNA gene sequence analysis with related bacteria showed that there are nine regions in the sequence of *M. pumilum* (type species of the genus *Mogibacterium*), which are species-specific and can, therefore, be used as specific primers for the detection of these bacterial species by PCR analysis. Supported by Grants from the Japanese Ministry of Education, Science, Sport and Culture (092205, 1167179 and JSPS P99174).

P-47 Efficacy of A Toothpaste Containing Sodium Chloride, Triclosan and Fluoride. C. P. KHOR*, SWAMINATHAN D, TAIYEB ALI T.B. Faculty of Dentistry, University of Malaya, Kuala Lumpur, Malaysia.

Toothpaste is probably the best vehicle to carry anti-plaque, anti-caries and anti-calculus agents like triclosan, fluoride and sodium pyrophosphate respectively. Recently a toothpaste (*Hydent Salt*®) was produced locally incorporating a combination of sodium chloride, triclosan and fluoride. The effects of triclosan and fluoride are well documented, but literature on sodium chloride in toothpaste are few although it is known to promote healing and to exhibit some antibacterial properties. The aim of this double-blind parallel study was to evaluate the efficacy of this product on plaque, gingivitis, calculus and extrinsic dental stain. A group of 90 carefully screened subjects were randomly divided into 3 groups of 30 each. One group (test group T) used test product, another group (placebo group P) used a placebo toothpaste (without sodium chloride, Triclosan and fluoride) and the third group (group C) used a negative control toothpaste (without sodium chloride but containing Triclosan and fluoride) for a period of 12 weeks. Baseline measurements consisting of plaque (Quigley-Hein with Turesky modification Index), gingival bleeding (Loe & Silness Index), papillary bleeding (Saxer & Muhlemann Index), stain (Shaw & Murray Index) and calculus (Volpe-Manhold Index) scores were taken. Full mouth scaling and polishing was done for all subjects after baseline measurements, followed by oral hygiene instruction. A standard toothbrush was provided for all groups in this study. All subjects were reviewed every 4 weeks and the scores were charted at every visit. The results of this study indicated that the test product produced significant reduction of plaque accumulation, gingival bleeding, papillary bleeding and calculus formation after 12 weeks relative to the placebo ($p<0.05$). The test product also showed some reduction in gingival bleeding relative to negative control ($p>0.05$). **In conclusion, the study showed that the test product was effective in reducing plaque accumulation, gingival bleeding, papillary bleeding and calculus formation. The sodium chloride incorporated in the toothpaste may have contributed to the efficacy.**

P-48 The Biological Effect Of Fenretinide In Nasopharyngeal Carcinoma Cells Y. XIA*, N. S. WONG, H. TIDEMAN (Dept. of OMFS, Faculty of Dentistry & Dept. of Biochemistry, Faculty of Medicine, University of Hong Kong, Hong Kong)

As a member of the retinoids family, fenretinide (*N*-(4-hydroxyphenyl)retinamide) is a promising chemopreventive agents under intensive investigation. It has demonstrated potent efficacy and reduced toxicity against a variety of tumors including some head and neck cancers. To study its biological activity on nasopharyngeal carcinoma (NPC), the CNE3 cells originated from a NPC were treated with fenretinide. The cell morphological changes were observed by fluorescent microscopy, and cellular DNA alterations were detected with biochemical approaches including gel electrophoresis and flow cytometry. The obvious cell shrinkage, chromatin condensation and nuclear fragmentation after treatment of fenretinide indicated the occurrence of apoptosis, which was supported by the characteristic DNA 'ladder' formation on agarose gel and the sub-G₁ peak presence on flow-cytometric histogram. Therefore, our findings suggest that fenretinide is an effective apoptosis inducer in NPC cells at clinically relevant doses. It is interesting and meaningful to explore further the cellular pathways activated by fenretinide which might give insight to the carcinogenesis of NPC and help with novel therapeutic strategies.

P-49 The Association of Areca Quid Chewing and Oral Precancerous Lesions K LIN*, YH YANG, CH CHENG, CC LIN, and TY SHIEH (Graduate Institute of Oral Health Sciences, Kaohsiung Medical University, Kaohsiung, Taiwan)

The significant association between oral cancer and areca quid chewing has been reported in many southeast Asia countries. However, the relationship of chewing habit with oral precancerous lesions has not been conclusive. The purpose of this research is to investigate the association between oral precancerous lesions and different types of areca quid chewing (Lao-hwa quid and betel quid) in Taiwan. A matched case-control study was conducted in Kaohsiung Medical University Hospital. There were three groups of cases: 127 patients of oral cancer, 88 patients of oral submucous fibrosis and 129 patients of other oral precancerous lesions. The control group was matched by sex, age and occupation variables for each patient. The information of behavior of areca quid chewing, smoking and drinking was obtained by questionnaires. The odds ratio of chewing areca quid was 23.78 for having oral cancer, 164.96 for having oral submucous fibrosis and 23.68 for having other oral precancerous lesions, while adjusted by smoking and drinking. Among oral cancer patients, the percentage of chewing both Lao-hwa quid and betel quid was higher than chewing only betel quid (39.37% vs. 20.47%). The same feature was also seen among patients of oral submucous fibrosis (38.64% vs. 22.73%). Among patients of other oral precancerous lesions, the percentage of chewing only Lao-hwa quid was higher than chewing only betel quid (31.01% vs. 15.50%). We concluded that areca quid chewing was highly associated with oral precancerous lesions, and Lao-hwa quid might be more risky than betel quid. The risk of having oral cancer or precancerous lesions was also affected by longer chewing history and larger daily consumption.

P-50 Growth Inhibition of an Oral Squamous Cell line by an Antisense Oligodeoxynucleotide Complementary to Human *CCND1* mRNA. CHEN, QIANMING*, LUO, GANG, LI, BINGQI, L. P. SAMARANAYAKE. (Oral BioSciences, Faculty of Dentistry, The University of Hong Kong, Hong Kong)

Background and Purpose: Cyclin D1, the product of proto-oncogene *CCND1*, has been identified as an important positive cell cycle regulator. Our recent studies have demonstrated that aberrant Cyclin D1 overexpression and *CCND1* amplification are frequently involved in oral carcinogenesis. In this study, we aimed to observe the growth inhibition of an oral squamous cell line by an anti-sense oligodeoxynucleotide to human *CCND1* mRNA. **Material & Methods:** A human oral squamous cell carcinoma cell line, BcaCD885, was evaluated for the amplification of *CCND1* using a differential polymerase chain reaction (PCR; CHEN, et al. *Oral Oncology*, 2000, 36: 95 - 99). A direct PCR-DNA sequencing method was used to confirm the accuracy of the PCR amplification. Then, an anti-sense oligodeoxynucleotides complementary to human *CCND1* mRNA was transduced into BcaCD885 cell line using leptofoetin as a vector (Zhou P, et al. *Oncogene*, 1995; 11(3): 571 - 80). The yield of colony forming units of this cell line before and after the transduction were compared, as well as with an oligodeoxynucleotide-free, blank transduction. **Results:** Based on the differential PCR results, BcaCD885 demonstrated the amplification of *CCND1*, whilst DNA sequencing confirmed the accuracy of the PCR products. The number of colony forming units from the squamous cell line in culture decreased significantly in the group treated with the anti-sense oligodeoxynucleotides, when compared with all the control groups. **Conclusion:** The results suggest that the antisense oligodeoxynucleotides complementary to human *CCND1* mRNA is able to inhibit the growth of the oral squamous cell line (with overexpression of *CCND1*). Hence, *CCND1* may be a target for gene therapy in oral cancers. (This work was supported in part by a grant from the University Research Committee Grants of the University of Hong Kong, Hong Kong, No.10203005 / 30713 / 08011 / 302 / 01).

P-51 p21^{WAF1/CIP1} alterations in relation to the expression of p53 and Ki-67 in oral squamous cell carcinomas. N. SAOWAPA, L. CHAREONKIKAJORN, P. AMORNPHIMONTHAM, K. ARYATAWONG AND S. KOONTONGKAEW* (Prince of Songkla University, Faculty of Dentistry and Hat Yai Regional Hospital, Thailand)

To analyze relevant factors of neoplastic transformation in the oral cavity, the expression of p53, p21^{WAF1/CIP1} and Ki-67 was immunohistochemically investigated in oral squamous cell carcinomas (n=34). The positive rates of p53, p21 and Ki-67 expression were 59, 82 and 91%, respectively. Generally, p53 was mostly observed in basal layers while p21 was consistently elevated in the superficial, differentiated cells of the epithelium. The Ki-67 positive cells were located mainly in basal and suprabasal layers. Interestingly, 44% (15/34) of the cases showed p53 accumulation and overexpression of p21. Fifty-three percent (18/34) of the specimens expressed both p53 and Ki-67 proteins. No significant correlation could be found between p21 and p53 or proliferation index (p>0.05). **In conclusion, p21 protein was overexpressed in oral squamous cell carcinomas. The overexpression was not related to cell proliferation and it may occur by both p53 dependent and independent mechanisms.**

P-52 Norcantharidin induced post G2/M arrest apoptosis is dependent with wild type p53

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Norcantharidin, a synthetic analogue of phosphatase type 2A (PP2A) inhibitors – cantharidin, has been reported to have effect on treatment of human and animal tumors. The tumor cell killing mechanisms by norcantharidin, however, remain unclear. In this experiment, the investigation was made to understand the mechanisms of norcantharidin mediated cytotoxicity. Effort was made to investigate if norcantharidin exerts its cytotoxicity through p53 dependent or independent mechanism. KB, CAL 27 (wt p53) and U251 (mutant p53) were used to expose to norcantharidin. Time course fluorescent-activated cell sorting (FACS) analysis showed that high doses of norcantharidin arrested the cells at the G2/M phase and post G2/M apoptosis in KB, CAL27 cell lines. There was, however, little apoptosis found in mutant p53 cell line exposed to norcantharidin. The results showed that norcantharidin kills tumor cells efficiently correspond to their p53 status. The results showed norcantharidin, at high dosage, kills tumor cells efficiently correspond to their p53 status. Western blot was used to further investigate whether p53 plays a role in the induction of G2/M arrest as well as apoptosis after expose to norcantharidin. Induction of p53 expression was found in wild type p53 cell line but not in mutant p53 cell line exposed to norcantharidin using western blot analysis. p53 downstream genes were also detected after norcantharidin exposure with western blot and immunohistochemistry at in vivo tumor model. The results showed that norcantharidin induced apoptosis through p53 and bax dependent mechanisms. The delivery of p53 into the mutant p53 cell lines would enhance norcantharidin act on cells. The results implied that norcantharidin induced apoptosis through p53 dependent mechanisms. Addition of p53 may increase the chemo-sensitization effect of Norcantharidin.

P-53 Molecular Typing by Random Amplification of Polymorphic DNA (RAPD), and Biotyping of Sequential Oral Isolates of *Candida albicans* in HIV infection L. P. SAMARANAYAKE*, Y. H. SAMARANAYAKE, P. C. S. TSANG, S. ANIL Oral Bio-Sciences, Faculty of Dentistry, University of Hong Kong, SAR China

Several investigators, using an array of genetic and phenotypic tools, have shown that HIV-infected patients are frequently infected with the identical sub-type of *C. albicans* over multiple episodes of infection while others have found the opposite. Aim: Hence the purpose of this study was to evaluate the genetic and phenotypic diversity of oral *C. albicans* isolates on single and sequential visits in HIV-infected ethnic Chinese. **Materials:** A total of 16 ambulatory, community dwelling HIV-infected individuals were examined over a period of one year. At each visit the oral cavity was sampled using the oral rinse technique (Samaranayake et al *J Oral Pathol*, 1986; 15:251-4) and cultured on Sabourauds dextrose agar to obtain the yeast growth. Up to five colony forming units (CFU) of *C. albicans* were selected and identified at each visit, yielding a total of 441 isolates from 16 patients. To obtain the genotypic profile all isolates were typed by RAPD analysis using two custom synthesised primers (Gibco BR, Hong Kong; *Nucleic Acid Res* 1992; 20 : 5137-42). The organisms were biotyped using a combination of the API 20C, API2YM and boric acid resistance test (Xu and Samaranyake *Arch Oral Biol* 1995; 40: 577-579). **Conclusions:** 1) multiple clones of *C. albicans* exist intra-orally in HIV disease 2) hence, it is essential to select and evaluate more than a single CFU at each visit to decipher their complete pathogenic profile, 3) in general, most patients appear to carry the same strain throughout, 4) as there is little congruence between the RAPD genotypes and the biotypes it is imperative to use multiple typing tools to ascertain the 'true sequential carriage', 5) although the RAPD technique is simple, versatile and reproducible for evaluating sequential carriage of yeasts, judicious selection of primers and their combined use appear essential to obtain reliable data. (Supported by the Research Grants Council of Hong Kong)

P-54 Sequential isolates of *Candida albicans* in HIV infection exhibits progressive resistance to human lactoferrin. Y. H. SAMARANAYAKE*, L. P. SAMARANAYAKE, V. T. BEENA and K. W. S. YEUNG , Oral Bio-Sciences, Faculty of Dentistry, The University of Hong Kong, Hong Kong, SAR.

A variety of innate defense factors in saliva such as lactoferrin contribute to mucosal protection, and changes in the salivary concentrations of lactoferrin (HLF) have been observed in HIV-1 infection. Aim: The aim of this study was to determine the *in vitro* susceptibility of 59 genotyped, oral *C. albicans* isolates from six HIV-infected individuals during sequential visits, to HLF using a blastospore viability assay. **Methods:** The organisms were genotyped using a RAPD assay according to Bostak et al. (*J. Gen. Microbiol.*, 1993; 139: 2179-84). The HLF viability assay was conducted according to the method of Soukka et al. (*FEMS Microbiol Letts.*, 1992; 90: 223-28) by exposing a standard suspension of the organisms to 20 µg/ml human lactoferrin (Sigma) for 60 min. and estimating the yield of colony forming units on Sabourauds' dextrose agar. **Results:** Exposure to HLF caused a rapid loss of viability among all isolates to varying degrees. None of the sequential, 59 *C. albicans* isolates demonstrated significant differences in sensitivity to HLF from one visit to the next. The ten genotypes demonstrated no significant differences in susceptibility to HLF and were uniformly sensitive to the enzyme. On regression analysis of a sequentially isolated genotype of one patient, a significant negative correlation (r=-0.78) between the HLF resistance and the HIV disease progression was seen. **Conclusion:** These results indicate that a minority of *C. albicans* that persist intra-orally in HIV disease may develop progressive resistance to human lactoferrin as an adaptive response, while the majority are unaffected. (Supported by a grant from the Research Grants Council and the CRCG of the University of Hong Kong, Hong Kong SAR).

P-55 The Association of Areca Quid Chewing and Radiographic Alveolar Bone Loss.. CN HSIAO*, GL HOU, YH YANG, CC LIN, and TY SHIEH (Graduate Institute of Oral Health Sciences, Kaohsiung Medical University, Kaohsiung, Taiwan)

Areca quid chewing is a common masticatory drug used in South East Asia, India, and the South Pacific. It is used daily by 600 million people worldwide, and is a public health problem. In the past fifteen years, many investigations about areca quid chewing have focused on exploring epidemiology, premalignant changes, genetic factors and components of areca quid, but investigations concerning periodontitis have been quite few. The purpose of this study is to evaluate the relationship between areca quid chewing and periodontitis. One hundred and seventy seven subjects were recruited in the sample with which 117 areca quid chewers and 60 subjects without habit. After taking panoramic films and using a questionnaire to survey individual characters, we measured radiographic alveolar bone loss (RAL) in the lower first molar. Areca quid chewer's annual radiographic alveolar bone loss was up to 2.88 times the no habit group. The odds ratio for association of chewers with severe alveolar bone loss was 22.07 for no habit samples. We concluded that a significant relationship does exist between areca quid chewing increase the loss of alveolar bone. These data support the concept that areca quid chewing are the important factors to radiographic alveolar bone loss.

P-56 Mouse primary palatal mesenchymal cells express functional PAR1 thrombin receptors. K.Y. WANG, F.H.F. CHANG, J.H. JENG, L.T. HOU, K.C. CHEN and M.Y.P. KUO* (School of Dentistry, National Taiwan University, Taipei, Taiwan).

To study the molecular and cellular processes during mouse primary palatogenesis, we have isolated mesenchymal cells from primary palate of BALB/cBy embryos (day 11 hour 20). Most of the primary palatal mesenchymal (PPM) cells had a morphology similar to fibroblasts. The population doubling time was about 36 h. At concentrations of 5 and 10 unit/ml, α -thrombin significantly stimulated PPM cell proliferation by 2- to 2.4-fold compared to untreated controls over a 72h incubation period. Reverse transcriptase-polymerase chain reaction analysis using primers based on the mouse PAR1 thrombin receptor detected PAR1 mRNA in the PPM cells, whose authenticity was confirmed by partial DNA sequencing. Blocking of the α -thrombin proteolytic site with the highly specific inhibitor D-Phenylalanyl-Prolyl-Arginyl chloromethyl ketone (PPACK) significantly suppressed the mitogenic effect of thrombin on the PPM cells by 71%. These results suggest that PAR1 was present on PPM cells in the mouse embryo and that serine protease activity is important for receptor activation.

P-57 Computer-Based Characterization of Bilateral TMJ Sound Recordings. S.B.Keng*, K.B.C. Tan, A.U.J. Yap, W.W. Tok (Faculty of Dentistry, National University of Singapore)

TMJ sounds are usually classified by the loudness, character and timing of their locations. There is still uncertainty regarding these interpretations primarily because comparisons of sound recordings between observers are usually based on verbal descriptions and when using auscultation, it is often difficult and subjective. The aim of this study was to develop a system to record sounds using an omni-directional microphone system customized for the subjects using special ear moulds with sleeve to hold the microphone heads and then analyzed by a computer software. Sony electret omni-directional capsule condenser microphones (ECM 77B, 40 Hz to 20,000 Hz, 5.6mm circular diameter X 12.5mm Length) were placed in customized moulded earplugs (silicone, Aquasil-Densily). This technique ensured stability of the microphone to prevent extraneous sound interferences. The system developed was tested on 15 subjects (age range 22-24 yrs) from a non-TMD group. Right and left microphone leads were connected to a Digital Tascam recorder. The following mandibular movements were recorded, 1) Three Open / close 2) Two right lateral 3) Two left lateral and 4) Two protrusive for each separate right and left leads per subject making a total of 270 sound bytes. These were captured on tape and then transferred to a Pentium Computer. Using SoundForge digital audio-editing software the sound byte recordings were analyzed by 2 examiners. The wave patterns (Wav.) were analyzed and showed consistent different patterns for normal sounds, clicks and crepitations. Crepitation sounds have longer time duration with multiple peak bands compared to the short sharp distinct peaks for clicking. The sensitivity of the system also differentiated sounds from the contra lateral side. Close inspection revealed similar waveform but of smaller amplitude. This is useful as normal auscultation sounds are often confounded by these bone conducted sound transmissions. This technique of using computer analysis of bilateral sound recordings will be an objective tool in further analysis of TMJ sounds in a TMD population. Supported by NUS Research grant RP 970306

P-58 Histological and Histochemical Changes in the Temporomandibular Joint after Unilateral Removal of Teeth. Q. HUANG, H. TIDEMAN, D. OPSTELTEN (Faculty of Dentistry & Dept. of Biochemistry, Faculty of Medicine, University of Hong Kong)

Abnormal loading due to unilateral removal of teeth causes pathological and pathophysiological changes in the temporomandibular joint (TMJ). The objective of this study was to investigate changes in the surface of the condyle induced by unilateral removal of teeth in the rabbit. The significance of this study was to find indicators of changes in TMJ cartilage for achieving an early diagnosis to help with the treatment of pain and dysfunction arising within the TMJ. 15 adult male rabbits, with the lower right side teeth extracted, were sacrificed 3 or 6 weeks later. Age-matched untreated rabbits served as control. The TMJs were obtained en bloc. The specimens were fixed, decalcified, embedded and sectioned at 5 μ m by means of a microtome. Sections were processed with Hematoxylin & Eosin (HE), Safranin O staining and were studied under the light microscope. The HE results showed that irregular nuclei were found in the fibrous, pre-chondroblast and functional chondroblast layers of condylar cartilage after 3-wk of tooth extraction. At 6-wk, the nuclei were more round compared to the 3-wk group, especially at the working side. Sulfated glycosaminoglycans (GAGs) detected by Safranin O staining were abundant in the functional and hypertrophic layers of condylar cartilage. Stronger binding of Safranin O was presented in the condylar cartilage at 3-wk and the non-working side of 6-wk after tooth extraction. Nuclei abnormalities may indicate decreased metabolic activity, leading to a reduced GAGs degradation rate, resulting in an elevated level of sulfated GAGs in condylar cartilage. In addition, higher Safranin O binding levels may indicate that the changed compressive forces due to unilateral removal of teeth result in elevated level of sulfated GAGs in condylar cartilage as a repair response.

P-59 Recruitment of jaw elevators and sternocleidomastoid muscle at different antero-posterior jaw positions. Liu Yi-Hsien, Ou Tzay-Fuh*, Lin Li-Deh and Wang Juo-Jong (Graduate Institute of Dentistry, National Taiwan University, Taiwan, ROC)

In order to gain insight into the differences between muscle recruitments of normal and TMJ arthritic patients, the purpose of this study was to examine muscle activities of jaw elevators and sternocleidomastoid (SCM) muscle at different antero-posterior jaw positions under controlled bite forces. 20 patients with obvious occlusal change after TMJ arthritis and 21 normal subjects were selected. With the calibrated force transducer positioned at first molar area, 50, 100 and 150 newton forces were asked to exerted at centric, 2 and 4 mm straight protrusive jaw positions separately. Muscle activities of bilateral sternocleidomastoid, masseter, anterior and posterior temporalis were recorded by surface electrodes. Each biting task included 5 trials of 3 consecutive seconds. Root mean square of the muscle activities were measured, which were then analyzed by general equation estimation (GEE) model. The results showed that bite forces positively influenced the muscle activities ($p < 0.05$) in both groups especially in anterior temporalis. The muscle activities was negatively influenced by protrusive jaw positions only in control group ($p < 0.05$), but not significant in patient group. Bite fork position negatively influenced ipsilateral side of muscle activities ($p < 0.05$). Muscle recruitment pattern of SCM during force increasing showed similar tendency as that of masseter muscles. Based on these findings we concluded that SCM seemed to show co-contraction phenomenon with masseter muscle, and magnitude of bite force was the most significant factor to influence muscle activities; however, muscle recruitment of jaw elevators did not show significant difference between patient and control groups. This study was supported by NSC 89-2314-B-002-182 of Taiwan ROC.

P-60 Changes in masseter muscle activity during orthodontic treatment and their correlations with orthodontic pain
Chi-Yang Tsai*, Tai-Lu, Sun-Long Chou
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This study was conducted to investigate changes in masseter muscle activity and their correlations with orthodontic pain produced by tooth movement during orthodontic treatment. Six volunteers participated in this study. Muscle activity data were collected using a portable EMG system, and bilateral masseter muscle activity were counted over 12-hour periods before and during 1st, 6th, 15th, 29th day of orthodontic treatment to investigate changes in masseter muscle activity. The pain response was assessed by VAS every 4 hours to investigate the influence of orthodontic pain on masseter muscle activity. EMG data on recording tape were then reproduced, transformed, converted, and finally analyzed on a personal computer. This study showed that orthodontic pain increased since 4th hour and peaked in the next night after the placement of the arch wire, then gradually subsided off toward the 5th or 6th day. In addition, overall a diurnal variation was found with a tendency to an increase in pain in the nights. Both burst duration and burst numbers showed decreasing quickly then recovering slowly to original pretreatment levels during the initial leveling. Wilcoxon matched paired test showed significant differences ($p < 0.05$) of the burst duration and the burst numbers before and after initial leveling. Spearman rank correlation showed negative correlation between masseter muscle activity and orthodontic pain. It was concluded that orthodontic pain produced by orthodontic treatment was the reason that reduced the masseter muscle activity during the pain period.

P-61T Finite Element Vibration Analysis of Dental Implant with various Boundary Conditions
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The goal of current study is to provide a preliminary numerical analysis of the vibrating behavior of a dental implant at implant-bone interface. A 3D cylinder-type titanium implant FE model was established, with physical dimensions of 3.75 mm x 10 mm. The implant was placed into a 10x10x15 mm³ section of bone. The natural frequencies of the FE model were calculated under different boundary levels and bone densities. Our results indicated that the modeled natural frequency decreased linearly ($r = -0.975, p < 0.01$) from 17921 to 4966 Hz, with a decreased ratio of 72.3%, while boundary levels decreased 6.8 mm below the first thread of the screw. On the other hand, a linear relationship ($r = 0.996, p < 0.01$) also found between the bone density and natural frequencies of the implant. Natural frequencies decreased linearly from 17921 Hz (without bone loss) to 641 Hz (90% bone loss) when the bone densities decreased. On the other hand, a highest resonance frequency value (36.1 kHz) was found when the implant was placed into TYPE I surrounding bone. The resonance frequency of the implant with TYPE IV bone quality was computed as 9.9 kHz, which was almost fourfold smaller than that in the TYPE I bone condition. Our results supported that natural frequency analysis could be a useful clinical tool in the diagnosis during surgical process, and prognosis of implanted dental implant during the healing stages and subsequent routine follow-up care after the treatment.

P-62T An Assessment of Pont's Index Relevancy in Vietnamese Population.
Pham T. H.L.* And Hoang T. H. (Faculty of Odonto-Stomatology, HCM City, Viet Nam)

This study aimed to apply Pont's Index and to assess its relevancy in Vietnamese adults noted with sound dentition and normal occlusion (36 male and 37 female). The following measurements were obtained from plaster casts, using Boley gauge: mesio-distal crown diameters of the four maxillary incisors (MDCD), inter-premolar (PMA) and inter-molar (MMA) maxillary arch width as specified by Pont. A series of double determinations ensured measuring reliability. Using MDCD and Pont's original index, mean maxillary arch width was calculated and compared to mean PMA and MMA. Pont's formula was then applied to measurements obtained from casts in order to determine the specific Pont's Index of the studied sample. The following results were observed (in mm):

	Male		Female	
	Premolar	Molar	Premolar	Molar
Calculated mean	39.12	48.89	37.68	47.09
Observed mean	37.95	49.44	36.54	47.41
t-test	<0.001	>0.05	<0.001	>0.05

PMA diameter is significantly smaller in both sexes pointing to ethnic characteristics related to tooth mesiodistal diameters, dental arch shape and protrusion in the anterior region that were confirmed by other studies following different approaches.

The calculated Pont's index in this sample is respectively 82.64 for premolar and 63.58 for molar region, comparing to original Pont's index of 80 and 64 in European population. It is suggested that Pont's index which is currently used in Orthodontic treatment planning should be adjusted, when applied to a defined population, for better relevancy.

P-63T Cell Permeability of Guided Tissue Regeneration Membranes *in vitro*
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The concept of gingival cell occlusion and tissue integration are the key points of success in Guided Tissue Regeneration. In this study, non-bioabsorbable expanded polytetrafluoroethylene (ePTFE) membrane (Gore-Tex®), bioabsorbable poly(lactide) and polyglycolic acid (PLA-PGA) membrane (Resolut-XT®) and collagen membrane (Biomead®) were utilized in experimental groups. Millipore® was utilized in control groups. A membrane was fixed in a tube. Human gingival fibroblasts were cultured on the membranes within DMEM medium. After 24, 48 and 72 hours, the membranes were removed from the tubes and fixed with 2.5% glutaraldehyde, dehydrated, dried, and observed with scanning electron microscopy. The penetrated cell numbers were counted by flow cytometry. The results showed more fibroblasts attached to the PLA-PGA and collagen membranes over the upsides and downsides. The penetrated cells were 1*10³ for PLA-PGA membranes and 5*10³ for collagen membrane. The result indicated differences of the human gingival fibroblast behavior and permeability among e-PTFE, PLA-PGA and collagen membranes during early stage of guided tissue regeneration. (This study was supported by a NSC grant NSC-88-2314-B-038137, National Sciences Committee, Taiwan, ROC)

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