
UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
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UNIVERSITY OF OTAGO
FACULTY OF DENTISTRY
SIR JOHN WALSH
RESEARCH INSTITUTE
TE POKAPŪ RAKAHAU O TĀ JOHN WALSH
Research
Day 2014
Programme and Abstracts
Thursday 31 July 2014
Dunedin Public Art Gallery
3M ESPE

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Sir John Walsh Research Institute

The Sir John Walsh Research Institute, a Research Centre of the University of Otago, advances research and increases knowledge for the improvement of oral health in New Zealand. Its innovative, future-focused, interconnected research programmes cover the spectrum of oral health research, from the molecular level through biological systems to the health of populations. The Institute is part of New Zealand's only Faculty of Dentistry and its members have well-established productive collaborations across the University and with other institutions in New Zealand and worldwide. Among its research objectives is to develop clinical and practice-based research that translate discoveries into measurable health improvements, and to maintain fundamental research that underpins teaching.

3M ESPE

The Sir John Walsh Research Institute Research Day 2014 is made possible by the generous support of 3M ESPE.

SJWRI Research Day 2014 is dedicated to the memory of Professor Jules Kieser, who passed away suddenly and unexpectedly on 10 June 2014.

Jules was a dynamic academic who made outstanding contributions to teaching and research at the University of Otago and to forensic services in New Zealand and abroad.

Jules was the inaugural Director of the Sir John Walsh Research Institute, and moulded the SJWRI into the successful research centre that it is today. He had many research interests including oral biomechanics, anatomy, paleoanthropology and paleopathology.

Jules was a valuable member of the Dunedin forensic odontology team. In addition to assisting local police with forensic investigations he received commendations for his contribution to disaster victim identification after the Boxing Day tsunami in 2004 and the Christchurch earthquake in 2011.

Jules will be remembered by many for his humour, his wry smile, his passion for research and his genuine concern for his colleagues and students.

Research Day Programme

Auditorium, Dunedin Public Art Gallery, Dunedin, 31 July 2014

8.30am	**Registration:**	Auditorium, Dunedin Public Art Gallery, Dunedin
9.00am	**Introduction:**	Professor Alison Rich, Acting Dean, Faculty of Dentistry
	Māori Welcome:	Professor John Broughton, Director – Ngāi Tahu Māori Health Research Unit
	Opening Address:	Professor Richard Blaikie, Deputy Vice-Chancellor – Research and Enterprise
SESSION 1 9.20 – 10.30am		Chair: Professor Richard Cannon
9.20am	**Keynote speaker:** Dr Brian Monk	
10.00am	**Director's Address:** Professor Richard Cannon, Director, Sir John Walsh Research Institute Presentation of the 2013 SJWRI Awards	
10.10am	**3M ESPE Presentation:** Helen Gerrard	
10.30 – 11.00am	**Morning Tea in the ODT Gallery with our sponsor 3M ESPE's representative and display SJWRI Research Day Poster Competition**	
SESSION 2 11.00am – 12.30pm		Chair: Professor Karl Lyons
11.00am	**Keynote speakers:** Dr Don Schwass & Dr Carla Meledandri	
11.30pm		Kai Chun Li
11.45pm		Mo'men Atieh
12.00pm		Sophie Gray
12.15pm		Andrew Parton
12.30 – 1.30pm	**Lunch in the ODT Gallery with our sponsor 3M ESPE's representative and display SJWRI Research Day Poster Competition**	

SESSION 3	**1.30 - 3.00pm**	Chair: Professor Murray Thomson
1.30pm	Keynote speaker:	Dr Jonathan Broadbent
2.00pm		Hadeel Ibrahim
2.15pm		Joanna Ngo
2.30pm		Nick Knight
2.45pm		Noor Othman
3.00 – 3.30pm	Afternoon tea in the ODT Gallery with our sponsor 3M ESPE's representative and display SJWRI Research Day Poster Competition	
SESSION 4	**3.30 - 5.00pm**	Chair: Norman Firth
3.30pm		Shahrzad Khayami
3.45pm		Sarah Drake
4.00pm		Anne-Christine Lindström
4.15pm		Guangzhao Guan
4.30pm		Ramya Javvadi
4.45pm		Olive Allsobrook
5.00 – 5.30pm	Closing remarks from Professor Richard Cannon, Director, Sir John Walsh Research Institute Drinks in the ODT Gallery Announcement of Student Presentation and Poster Competition Winners	

Keynote research presentations

Antifungal drug discovery – insights, highlights and reality

Brian C. Monk
Department of Oral Sciences and Sir John Walsh Research Institute, University of Otago
2012 Sir John Walsh Research Award Winner

Fungal infections have been estimated to kill 1.4 million people per annum. They affect all age groups – the very young, females of reproductive age, the elderly and especially the immune compromised. The use of clinical isolates of pathogenic fungi, bakers yeast and a variety of molecular tools has enabled investigation of the biology of many fungal pathogens. Yet this new knowledge has had limited impact in the clinic i.e. the drugs used to treat fungal infections were discovered by the 1980s. Antifungal drug discovery and development have been hindered because blockbuster drugs are unlikely and antifungal resistance has been viewed as having a modest impact in the clinic. Can we now ask more relevant questions and explore ideas that will yield practical antifungals? Are there "ideal" broad-spectrum antifungal targets? Will knowledge of fungal biology and drug resistance mechanisms help make existing drugs more effective? Could knowledge of antifungal target structures improve antifungal design? Should antifungals used in the clinic differ significantly from those used in agriculture? These questions will be addressed by discussing new and old antifungal targets.

Dr Brian Monk is a Senior Lecturer in the Department of Oral Sciences and Director of the Molecular Biosciences Laboratory in the Faculty of Dentistry. Dr Monk's research aims to identify new antifungals by understanding the structure and function of membrane proteins that can be developed as drug targets. These targets are expressed in in yeast for effective screening of compound libraries and to obtain information about drug-target interactions. His work has identified novel approaches designed to circumvent the evolution of antifungal resistance.

Delivering the silver bullet: Development of a silver nanoparticle application for treating dental caries

Donald R. Schwass[1] and Carla J. Meledandri[2]

[1]Department of Oral Rehabilitation and Sir John Walsh Research Institute, University of Otago
[2]MacDiarmid Institute for Advanced Materials and Nanotechnology and Department of Chemistry, University of Otago

Silver nanoparticles are well known for their unique optical and antimicrobial properties but are inherently unstable in suspension, aggregating rapidly, reducing their effectiveness. Micelle structures offer a convenient way to stabilise small silver nanoparticles (<10 nm), thus retaining optimal potential prior to application.

Aqueous suspensions of size-controlled assemblies of micelle-aggregate stabilised silver nanoparticles were synthesised under optimal reagent conditions. These silver nanoparticle suspension offer vastly enhanced antimicrobial activity based on equivalent silver mass content compared to other forms of silver, and remain colourless after application on teeth. Surfactants selected for creating the supporting micelle structures generate an overall surface charge, allowing transportation of theses structures in an electric field to assist delivery deep into tooth structure.

Monodisperse 6.7- 9.2 nm sized silver nanoparticles, formed by chemical reduction of silver nitrate, were stabilised at the surface of micelle aggregates composed of the anionic surfactant sodium dodecyl sulfate (SDS). These structures subsequently formed 500 – 700 nm micelle aggregate assemblies, containing silver nanoparticles, with an overall negative surface charge.

In vitro studies conducted with these silver nanoparticle micelle aggregate structures showed they were capable of effectively inhibiting bacterial growth at over 25,000 times lower silver concentrations (as low as 8 µg/ml) than a commercial silver diammine fluoride preparation. Further, artificially applied sub-lethal combinations of current and voltage significantly enhanced the antimicrobial effects of silver nanoparticles (up to 50 times) when applied at the same time to broth monocultures of bacteria.

Further *in vitro* studies conducted on extracted human teeth, demonstrated these silver nanoparticles have a strong affinity for both the organic and inorganic components of natural tooth structure. Using ionotophoresis (a small current applied to the tooth) enhanced penetration of silver nanoparticles into dentine tubules can be achieved.

Dr Don Schwass is a Prosthodontist in the Department of Oral Rehabilitation, teaching Cariology, Restorative Dentistry, and Prosthodontics since 2010. He has over 17 years of private practice experience as a general dentist, and continues to work part-time in private specialist practice as well as his university commitments. He has a particular interest in the management of collapsing dentitions affected by severe tooth surface loss. He also has a strong interest in the integration of digital technologies such as CBCT and CAD/CAM into practice. Don has been an independent advisor to ACC, HDC and DCNZ for many years. Don's main research interests are with the development of diagnostic technologies and novel treatments for dental caries, and he holds a provisional product patent involving micelle-stabilised silver nanoparticles with unique antimicrobial and optical properties.

Dr Carla Meledandri is a Lecturer in the Department of Chemistry at the University of Otago. Her research is focused on the design, synthesis and characterisation of functional nanoscale and nanocomposite materials, and the investigation of their efficacy for applications in the area of biomedicine; specifically, for improved medical diagnosis and targeted therapy, particularly dental therapy. Carla has been an Associate Investigator in the MacDiarmid Institute since 2010.

Fluoridation in Dunedin

Jonathan Broadbent
Department of Oral Rehabilitation and Sir John Walsh Research Institute, University of Otago

In 1958, members of the Faculty of Dentistry and the Otago Branch of the New Zealand Dental Association first requested the Dunedin City Council to consider fluoridation of Dunedin's water supply. Dunedin commenced community water fluoridation in 1967. The Dunedin Multidisciplinary Health and Development Study commenced in 1972-1973, five years after fluoridation began. The Dunedin Study began with the assessment of the health and development of 1037 Dunedin-born babies, but the study continues prospectively to the present day. Dental and general health examinations have been conducted repeatedly to age 38 years thus far. This enables investigation of whether public health interventions such as residence in an area with community water fluoridation or dental self-care interventions such as use of fluoride toothpaste during childhood affect dental health in adulthood. This presentation explores the relationship of deciduous and permanent dentition dental caries rates and adult outcomes are associated with early life exposure to community water fluoridation. Findings of the Dunedin Study will be contrasted with previously published findings of the Christchurch Development Study.

Dr Jonathan Broadbent is a Dental Public Health specialist, and works as a Senior Lecturer in Cariology and Preventive Dentistry in the Department of Oral Rehabilitation. Jonathan is a past recipient of the NZDA Award for Research (2002) and Outstanding Young Dentist Award (2011).

Student research presentations

Microstructure and phase stability of cast, CAD/CAM and powder metallurgy manufactured Co-Cr dental alloy

Kai Chun Li
PhD candidate
Supervisors: *Professor David Prior[1], Dr J. Neil Waddell[2], Professor Michael Swain[3]*
[1]Department of Geology, University of Otago
[2]Department of Oral Rehabilitation and Sir John Walsh Research Institute
[3]Biomaterials Laboratory, Faculty of Dentistry, University of Sydney

Aim
The objective of the present study was to identify the different microstructures produced by CAD/CAM, powder metallurgy (PM) and cast techniques for Co-Cr alloys and its phase stability after conventional porcelain firings.

Methods
Three porcelain layered rectangular Co-Cr plates (20 × 8.0 × 1 mm) of each processing technique were fabricated. Microstructural evolution was observed after heating the specimens through conventional porcelain firing treatment of 0, 5 and 15 cycles. Specimens were removed of surface damage through sequential polishing to a <0.05 µm finish with colloidal silica in preparation for electron backscatter diffraction (EBSD) and energy dispersive spectrometry (EDS) analysis.

Results
EDS analysis at the metal-porcelain interface indicated subtle differences in compositional change. EBSD data revealed a substantially higher stability of the face-centered cubic (fcc) phase after porcelain firing treatment in the CAD/CAM and PM produced Co-Cr alloy compared to the cast Co-Cr alloy. CAD/CAM and PM Co-Cr alloys was also found to have much finer bulk grain sizes (~19-30 µm) compared to the cast alloy (>200 µm). Orientation relationships of $\{111\}_{fcc}//\{0001\}_{hcp}$ and $\{110\}_{fcc}//\{1120\}_{hcp}$ were identified in the bulk portion of the three alloys but was absent for the fcc/hcp phase at the metal-porcelain interfaces.

Conclusion
CAD/CAM and PM produced Co-Cr alloy exhibit superior fcc phase stability after porcelain firing treatment compared to cast Co-Cr alloy.

Immediate single implant restorations in mandibular molar extraction sockets: A four-year controlled clinical trial

Mo'men Atieh
DClinDent candidate (Periodontology)
Supervisor: *Associate Professor Warwick Duncan*
Department of Oral Sciences and Sir John Walsh Research Institute, University of Otago

Aim

The aim of this study was to report four-year quantitative and qualitative outcomes of a novel implant design when used for immediate restoration of single missing mandibular molar teeth.

Methods

In a controlled clinical trial, an 8 or 9 mm diameter implant was placed into either a fresh molar extraction socket or a healed site. All implants were immediately restored with provisional crowns within 48 hours. After eight weeks, the provisional crowns were replaced with full ceramic crowns. In-depth, audio-recorded, semi-structured interviews with 15 participants were also conducted, transcribed verbatim and analysed using inductive and content analysis.

Results

The overall implant success after one year of service was 75.0%, with no significant difference observed between the two groups ($P = 0.35$). None of the implants failed during the remaining observation period. The difference between the two placement groups remained insignificant at four years ($P = 0.16$). The qualitative study showed that the major decisive factor in selecting implant treatment option was the cost of treatment rather than the potential advantages that an implant-supported prosthesis could offer.

Conclusions

The rehabilitation of single missing mandibular molars by immediately-placed and restored wide-diameter implants was associated with a relatively high failure rate in the first eight weeks even though the successful implants showed favourable bone changes and improvements in implant stability values after four years of function.

Validity of the Cervical Vertebral Maturation method for predicting mandibular growth peak

Sophie Gray
DClinDent candidate (Orthodontics)
Supervisors: *Professor Mauro Farella, Professor Jules Kieser*
Department of Oral Sciences and Sir John Walsh Research Institute, University of Otago

Cervical Vertebral Maturation (CVM) is a commonly used method of determining accelerated growth periods in dentofacial orthopaedics. CVM has been criticised due to its subjective nature.

Aims
(1) to analyse the morphometric changes in the outline of the second to fourth cervical vertebrae (C2-C4) with growth; and (2) to test the validity of the assumptions underlying the CVM method.

Methods
Lateral cephalograms of 25 participants from ages 10 to 16-years were acquired from the Toronto-Burlington Growth Study. Mandibular and cervical vertebral landmarks were digitized. Point distribution models were used to describe the morphometric templates of the vertebrae in relation to chronological age and timing of peak mandibular growth. Mixed model analysis was used to determine the relationship between mandibular length, sex, CVM stage and chronological age.

Results
Morphometric changes of C2-C4 during growth were consistent with the CVM descriptions. However, mandibular length changes were not significantly associated with CVM stages after adjusting for chronological age. Morphometric templates of vertebral shapes were similar before and during mandibular growth peak, with changes only detectable after the growth peak had passed. With chronological age, morphometric vertebral shape changes varied between sexes. Peak mandibular growth occurred at a mean age of 11.7 years in females (95% C.I = 11.1-12.3 years) and 12.8 years in males (95% C.I = 12.1-13.5 years).

Conclusions
Morphometric changes of the second to fourth cervical vertebrae are poorly related to mandibular growth rate. Chronological age represents a better predictor of mandibular growth peak than CVM stage.

CBCT implant-based superimposition of the growing rabbit mandible

Andrew Parton

DClinDent candidate (Orthodontics)

Supervisors: *Professor Mauro Farella, Associate Professor Warwick Duncan, Professor Jules Kieser*

Department of Oral Sciences and Sir John Walsh Research Institute, University of Otago

Aim

The aim of this project was to develop an animal model that could be used for the reliable assessment of the 3D morphological changes of the mandible during growth, by using implants as fiducial markers.

Methods

Titanium implants were placed in the body of the mandible of six growing New Zealand white rabbits. CBCT scans were taken 1-week following implant placement (T1) and after an additional 8-weeks of growth (T2). CBCT images of the mandibles and implants were segmented, implant centroids were identified, and implant stability during growth was determined. The segmented mandibles from the T1 and T2 CBCT scans were registered on the stable implant centroids using custom-made software. Semi-transparencies of 3D overlays of the registered mandibles were produced to enable visualisation of the morphological growth changes.

Results

All rabbits recovered well from implant placement surgery. The buccal cortical bone of the body of the mandible seemed stable during growth and was suitable for the placement of implants as fiducial markers. At least 3 stable implants were required for rigid registration. Qualitative descriptions of mandibular morphological growth changes were achieved from semi-transparencies of 3D overlays.

Conclusion

This animal model seems to be reliable for the assessment of the 3D morphological changes occurring during mandibular growth.

Personality and self-reported oral health

Hadeel Ibrahim
DClinDent candidate (Prosthodontics)
Supervisors: *Professor W. Murray Thomson, Professor Karl Lyons, Dr Lyndie Foster Page, Ms Suzanne Hanlin*
Department of Oral Rehabilitation and Sir John Walsh Research Institute, University of Otago

Aim
Recent work in health psychology clearly associates personality characteristics with health, most notably with the negative emotionality dimension of personality. The degree to which this personality trait mediates self-reported oral health has yet to be determined. This study investigated personality as a modifying factor in subjective oral health.

Methods
A cross-sectional study of a representative New Zealand adult population sample was undertaken. The questionnaire was mailed to 523 randomly-selected participants. Data were collected on: socio-demographic characteristics; oral and general health care; oral–health-related quality of life (OHRQoL); xerostomia; dental anxiety; and the personality characteristics of positive and negative affect (PA, NA). A total of 253 questionnaires were completed and returned, yielding a 51.8% response rate.

Results
Our study found that the prevalence of xerostomia was 7.8%. More than half of those with xerostomia reported one or more OHIP-14 impacts "often" or "very often". The prevalence rates for dental anxiety were 18.6% using DAS and 13.0% using IDAF-4C. After controlling for confounding factors, those scoring higher on Negative Emotionality were more likely to report 1+ OHIP-14 impacts. They also had a greater risk of reporting xerostomia and dental anxiety.

Conclusion
Responses to self-report measures can be influenced by particular personality traits. Therefore, it is important to consider this when using and interpreting such measures.

Living with dry mouth – Sjögren's patients' perspectives

Joanna Ngo
DClinDent candidate (Special Needs Dentistry)
Supervisors: *Dr Anita Nolan, Dr Shelagh Ferguson, Professor W. Murray Thomson*
Department of Oral Diagnostic and Surgical Sciences and Sir John Walsh Research Institute, University of Otago

Aim

The aim of this qualitative study was to provide clinicians with insight into how dry mouth can impact on the daily lives of Sjögren's Syndrome (SS) patients. SS is an autoimmune exocrinopathy characterised by lymphocytic infiltration of exocrine glands in multiple sites, with dry mouth as a primary presenting symptom. Although quantitative studies have shown the negative impact of both dry mouth and SS on patients' quality of life, no qualitative diary and interview study has been undertaken to examine the specific impact of dry mouth on SS sufferers.

Methods

The revised international classification criteria (AECG) were used to identify participants from patients seen in the oral medicine clinic. After pilot study work to test the approach, the 10 main study participants were recruited. Diary entries and semi-structured interviews were used to explore how dry mouth affects the lives of SS sufferers. Owing to the exploratory nature of the research, thematic content analysis was applied, allowing the themes to arise naturalistically from the data without bias or elicitation.

Results

The main themes included the: (1) journey to diagnosis; (2) disease impact spectrum of dry mouth amid other symptoms; (3) interactions with healthcare professionals (HCPs); and (4) coping mechanisms utilised to manage dry mouth and SS.

Conclusion

The findings revealed patients' perspectives on diagnosis, coping with dry mouth and SS, and interaction with HCPs. Dry mouth is not a trivial symptom for SS sufferers; it has considerable impact on their day-to-day lives. HCPs need this understanding in order to be part of the Sjogren's journey.

Colonisation of acrylic denture fitting surfaces by *Candida* species

Nick Knight
DClinDent candidate (Prosthodontics)
Supervisors: *Professor Richard Cannon, Professor Karl Lyons, Dr Vincent Bennani*
Department of Oral Rehabilitation and Sir John Walsh Research Institute, University of Otago

Aim

To investigate the patterns of oral mucosal and acrylic denture fitting surface colonisation by *Candida* species.

Methods

A convenience sample of edentulous patients attending the Faculty of Dentistry, University of Otago, for fabrication of new complete dentures was selected. Saliva and mucosal swab samples were collected from each participant and incubated on CHROMagar *Candida* plates. CHROMagar *Candida* impressions were captured from the fitting surfaces of boxed maxillary complete dentures. Growth of various coloured colonies indicated the presence of yeast species, the *Candida* species present and the number of colony forming units. Sampling was repeated following delivery and review of new dentures. Select colonies of *C. albicans* were characterised at the molecular level utilising multi-locus sequence typing to measure the genetic relatedness of the strains before and after denture fabrication.

Results

Preliminary results to date suggest that there may be a change in the relative numbers of species and a drop in the number of colony forming units of *Candida* species obtained from the fitting surfaces of new dentures for a period of at least three months. Molecular characterisation data on genetic relatedness and strain variation is still outstanding.

Conclusion

For a period of up to 3 months, fabrication of new complete dentures: reduces *Candida* colonisation of the denture fitting surface and saliva; reduces the colonisation by two or more *Candida* species; favours the relative growth of *Candida tropicalis* over *C. albicans* and *C. krusei*.

Antimicrobial peptide BM2 shows dose-dependent inhibition on monospecies biofilms

Noor Othman
DClinDent candidate (Endodontics)
Supervisors: *Professor Robert Love, Dr Brian Monk*
Department of Oral Rehabilitation and Sir John Walsh Research Institute, University of Otago

Aim

To compare the effects of BM2 and endodontic disinfectants on monospecies biofilms of common endodontic pathogens grown on dentine.

Methods

Bacterial strains *Enterococcus faecalis* JH2-2, *Streptococcus gordonii* DL1, *Streptococcus mutans* NG8 and yeast strain *Candida albicans* ATCC10261 precultured for 24 h in Todd Hewitt Broth (THB) or Tryptone Soy Broth (TSB), respectively, were used to grow biofilms on sterile dentine surfaces for 72 h. The biofilm mass treated with BM2 (D-NH_2-RRRFWWFRRR-$CONH_2$, 10 μg/ml, 20 μg/ml and 40 μg/ml), NaOCl (0.25%, 0.5% and 1%) or saturated $Ca(OH)_2$ was stained using a LIVE/DEAD assay™ kit and visualized using confocal laser scanning microscopy.

Results

After 72h BM2 at 20 μg/ml for *C. albicans* and 40 μg/ml for *S. mutans* and *S. gordonii* reduced biofilm mass by ≥75%. The effectiveness of BM2 (40 μg/mL) on *S. gordonii* and *S. mutans* was similar with NaOCl (1%, 10,000 μg/ml) and saturated $Ca(OH)_2$ ($P < 0.05$). *E. faecalis* was the least susceptible to BM2. At 72h BM2 (40 μg/ml) was effective as NaOCl (0.25%, 2,500 μg/ml) or saturated $Ca(OH)_2$ in causing biomass reduction. Of the cells remaining <50% were viable for *C. albicans*, *S. gordonii* and *S. mutans* and ≥65% for *E. faecalis*.

Conclusion

BM2 may have potential as an endodontic antimicrobial due to its efficacy in treating monospecies biofilms compared to existing endodontic disinfectants.

Effect of occlusal vertical dimension on swallowing pattern

Shahrzad Khayami
DClinDent candidate (Orthodontics)
Supervisors: *Professor Mauro Farella, Professor Jules Kieser, Dr Hannah Jack*
Department of Oral Sciences and Sir John Walsh Research Institute, University of Otago

Aim
To determine the effect of an acute change in occlusal vertical dimension (OVD) on tongue and lip pressure during swallowing.

Methods
Five male and five female volunteers (27-32 years) participated in this research. Intra-oral transducers were used to assess tongue and lip pressure, whereas surface electromyographic (EMG) electrodes were used to assess perioral muscle activity. The OVD was progressively increased using vacuum-formed trays of differing heights. Standardised swallowing tasks were performed repetitively with each tray in place. Individual swallowing waveforms were qualitatively and quantitatively analysed. Mean peak pressure, time to peak pressure, swallow duration and lip EMG peak activity were assessed for each swallow. Data were analysed using mixed-model analysis.

Results
Swallowing waveforms varied markedly between individuals, but within each individual, their shape was minimally affected by changes in OVD. When OVD was increased, swallow duration increased by 12.7% (160ms; $p = 0.01$). Upper lip peak pressure increased by 63.8% (2.1 kPa; $p \leq 0.001$) and intraoral peak pressure increased by 12.0% (1.3 kPa = 0.001). When OVD was increased, perioral muscle activity during swallows increased by 10.6% ($p \leq 0.01$) up to the OVD where resting lip seal was not attainable.

Conclusion
An acute increase of OVD produces swallowing episodes that are slightly stronger and longer than those recorded at the habitual OVD. The waveforms of the swallows, however, remain remarkably similar. The adaptive response and the waveform similarities associated with OVD variation supports the existence of both peripheral and central mechanisms to control swallowing.

Just below the surface

Sarah Drake
DClinDent candidate (Oral Medicine)
Supervisors: *Professor Alison Rich, Professor Jules Kieser, Associate Professor Warwick Duncan, Dr Trudy Milne*
Department of Oral Diagnostic and Surgical Sciences and Sir John Walsh Research Institute, University of Otago

Aim

To investigate how salt-water environments affect the retrieval of DNA from human teeth.

Methods

Forty caries- and periodontal infection-free extracted human third molars were collected. Twenty teeth were placed in the harbour as individual teeth with no protection from the environment (Group I) and a further 20 were surgically embedded into pig mandibles (Group II). In addition, to assess the difference between embedded teeth with and without attached periodontal ligament ten pig jaws with original teeth were used (Group III). Intertidal and fully submerged sea-water environments were compared. The teeth were recovered over 0-26 weeks. They were cleaned then pulverized using a SPEX 6770 freezer mill. gDNA was extracted *via* a silica-based extraction technique and the GAPDH gene amplified using a Taqman qPCR assay.

Results

Adequate amounts of high quality DNA were retrieved from time 0 teeth in Groups I and II respectively. Fragmentation of the DNA occurred to such an extent that within one week of exposure to marine conditions only negligible amounts of DNA remained to provide a template for qPCR amplification. After two weeks in seawater the DNA had degraded to a level where it was no longer possible to detect the GAPDH gene with qPCR amplification. Results relating to tidal variation for all three groups are being analysed.

Gunshot residue preservation in seawater

Anne-Christine Lindström[1]
PhD candidate
Supervisors & co-supervisors: *Associate Professor Jurian Hoogewerff* [2], *Dr Zuzana Obertova*[3], *Dr Josie Athens*[4], *Associate Professor Warwick Duncan*[1], *Dr J. Neil Waddell*[1], *Professor Jules Kieser*[1]
[1] *Sir John Walsh Research Institute, University of Otago*
[2] *Department of Chemistry, University of Otago*
[3] *Waikato Clinical School, University of Auckland*
[4] *Department of Preventive and Social Medicine, University of Otago*

Background
No full explanation has yet been given to the persistence of gunshot residue (GSR) in tissues during decomposition in marine environments. For a better understanding, qualitative and quantitative data on GSR retention was obtained by studying soft tissue and bony gunshot wounds.

Methods
Fleshed and defleshed bovine ribs were shot at contact range with .22 calibre hollow point ammunition using a Stirling .22 calibre long rifle. Triplicates were placed in three habitats: 1) submerged, 2) intertidal and 3) supralittoral zone. Decomposition was examined on day 3, 10, 24 and 38 and analysed with scanning electron microscopy, using energy dispersive X-ray spectrometry (SEM-EDX) and inductive coupled plasma mass spectrometry (ICP-MS).

Results
SEM-EDX recorded GSR-indicative particles surrounding the bullet entrance on all bone types (fleshed and defleshed) in all environments throughout the study. GSR-unique particles were only detected on the supralittoral bones. The most rapid loss of GSR was seen on specimens in the intertidal area followed by submerged and supralittoral specimens.

Conclusion
This study showed preservation of GSR in skeletal tissue up to at least 38 days, and highlights the usefulness of microscopic and analytical methods for examining suspected GSWs in highly decomposed bodies recovered from marine environments.

Expression of cyclin D1 and its correlation with p27KIP1 in normal oral mucosa, oral dysplasia and oral squamous cell carcinoma

Guangzhao (Simon) Guan
DClinDent candidate (Oral Medicine)
Supervisors: *Mr Norman Firth and Professor Robert Love*
Department of Oral Diagnostic and Surgical Sciences and Sir John Walsh Research Institute, University of Otago

Aim
To determine cyclin D1 and $p27^{KIP1}$ intensity of expression, location and pattern in oral epithelial dysplasia and oral squamous cell carcinoma by standard immunohistochemistry.

Methods
Specimens consisting of normal oral mucosa (n=10), oral epithelial dysplasia (n=12) and oral SCC (n=11) were prepared and stained using immunohistochemistry methods. Scanning software was used to determine cyclin D1 and $p27^{KIP1}$ intensity of expression, location and pattern.

The information was entered into an Excel spreadsheet and statistical analysis was conducted with the statistical software package SPSS version 22 (IBM Company, NY, USA).

Results
In contrast to the pattern of protein expression in the normal epithelial controls where cyclin D1 positive cells were restricted to the basal and parabasal layers, in the cases of oral epithelial dysplasia positive cells extended into the prickle cell layer and in the cases of oral SCC positive cells were seen throughout the entire thickness of the epithelium. However, normal epithelial controls showed more $p27^{KIP1}$ positive cells than oral epithelial dysplasia in the maturation compartment. There were no $p27^{KIP1}$ positive cells in oral SCC.

Conclusion
These results suggest that the characteristic expression of both cyclin D1 and $p27^{KIP1}$ correlate with the grade of oral epithelial dysplasia and degree of oral squamous cell carcinoma differentiation.

Novel cytokines in the pathogenesis of oral lichen planus

Ramya Javvadi
DClinDent candidate (Oral Pathology)
Supervisors: *Dr Praveen Parachuru, Dr Trudy Milne, Professor Gregory Seymour, Professor Alison Rich*
Department of Oral Diagnostic and Surgical Sciences and Sir John Walsh Research Institute, University of Otago

Aim
Oral lichen planus (OLP) is a complex immunological disease of oral mucosa, mediated in part by the release of cytokines by activated T-cells. Recently novel cytokines like IL33, IL35 and IL17 were identified in other chronic diseases. Their role in OLP is yet to be investigated.

Methods
Immunohistochemical staining was performed on 12 OLP and 7 non-specific inflammatory (NSI) formalin-fixed paraffin-embedded archival specimens using antibodies against IL33, IL35, IL17 and FoxP3. Quantitative and qualitative analysis was performed. Immunofluorescence double-labelling was performed to determine the presence of IL-33 and IL-35 in CD3+ T-cells.

Results
Both OLP and NSI tissues showed positive staining with FoxP3 and IL17 in the superficial connective tissue inflammatory infiltrate. Significantly more $FoxP3^+$ cells were present in the OLP tissues, while $IL17^+$ cells were significantly increased in the control tissues. IL33 and IL35 showed positive staining in both test and control groups although there were no significant differences between the groups. Neither IL-33 nor IL-35 were localised within $CD3^+$ T-cells in OLP or NSI tissues.

Conclusion
The present study demonstrated more $FoxP3^+$ T regulatory cells (Tregs) than $IL\text{-}17^+$ cells in OLP, suggesting that they may play an important role in the pathogenesis of OLP. Interestingly, IL-33 and IL-35 were not expressed on T-cells and further studies should be done to assess their functional role in OLP.

Angiogenic factors in oral squamous cell carcinoma

Olive Allsobrook
DClinDent candidate (Oral Pathology)
Supervisors: *Professor Alison Rich, Mrs Lara Friedlander, Professor Gregory Seymour, Dr Praveen Parachuru, Dr Trudy Milne*
Department of Oral Diagnostic and Surgical Sciences and Sir John Walsh Research Institute, University of Otago

Aim
To investigate the expression of vascular angiogenic markers in hyperplastic vascular oral lesions and oral squamous cell carcinoma (OSCC).

Methods
Archival formalin-fixed paraffin-embedded tissue from 10 gingival pyogenic granulomas (PGs), 10 cases of OSCC and 5 normal oral mucosal specimens were analyzed using immunohistochemistry for the angiogenic markers, vascular endothelial growth factor (VEGF), vasohibin-1 (VASH-1), VEGF receptor 2 (KDR), and CD34. Mean vessel density (MVD) was assessed using CD146. For the other antibodies, positive cells were counted and were analyzed using one-way ANOVA with a 5% level of significance.

Results
Positive staining for the angiogenic markers was seen in all groups. The MVD was significantly greater in PGs than in normal oral mucosa and in OSCC. Significantly more endothelial cells stained positively with VASH-1 in PGs. A qualitative analysis of the tissues showed a greater epithelial intensity of staining for VEGF in OSCC.

Conclusion
OSCC shows greater epithelial VEGF expression but less stromal VASH-1 expression compared with the control tissues suggesting angiogenesis self-regulating mechanisms may be altered in OSCC. Further research into this field will show the significance for treatment of OSCC with potential for regulation with angiogenesis inhibitors, and the prognostic significance of VASH-1 expression in tumours.

Poster competition entrants

Undergraduate students

Name	Title	Course	Authors
Catherine Edwards	Effectiveness of single-use tips for dental air-water syringes	BDS	C Edwards, V Bennani, N Chandler, B Lowe
Linda Hwang	Effect of air-polishing on titanium surfaces, biofilm removal and biocompatibility	BDS	L Hwang, V Bennani, A Tawse-Smith, R Cannon, G Tompkins, G Dias

Postgraduate students

Name	Title	Course	Authors
Olive Allsobrook	Angiogenic factors in oral squamous cell carcinoma	DClinDent	O Allsobrook, VPB Parchuru, L Friedlander, G Seymour, A Rich
Avadhoot Avadhani	Multiple cell types express interleukin 17 in oral squamous cell carcinoma	PhD	A Avadhani, A Rich, VPB Parachuru, T Milne, G Seymour
Joanne Choi	Continuous measurement of intraoral pH and temperature: Development and validation of an appliance	PhD	JE Choi, JN Waddell, M Farella, JA Kieser
Kai Chun (KC)	Cobalt-chromium porcelain -fused-to-metal systems: A comparison of three unique processing techniques	PhD	KC Li, DJ Prior, JN Waddell, MV Swain
Alia Sagatova	Erg11p structure in triazole resistant and susceptible strains of yeast	PhD	A Sagatova, MV Keniya, FU Huschmann, SM Willbanks, RD Cannon, JDA Tyndall, BC Monk

Ajay Sharma	Surface characteristics and biocompatibility of anodized Titanium-Zirconium (Ti-Zr) discs	PhD	A Sharma, J McQuillan, L Sharma, JN Waddell, WJ Duncan
Janine Tiu	Evaluating clinical molar preparations – Using the coordinate geometry method	PhD	J Tiu, B Al-Amleh, JN Waddell, WJ Duncan
Sobia Zafar	Bisphosphonates and geranylgeraniol regulate angiogenic genes in human gingival fibroblasts	DClinDent	S Zafar, DE Coates, GJ Seymour, B Drummond, TJ Milne, MP Cullinan
Sobia Zafar	Bisphosphonate regulates the cellular behavior and gene expression of osteoblasts	DClinDent	S Zafar, DE Coates, GJ Seymour, B Drummond, TJ Milne, MP Cullinan
Diogo Zanicotti	Human adipose-derived stem cells on titanium surfaces	PhD	DG Zanicotti, D Coates, GJ Seymour, WJ Duncan

Staff

Name	Title	Department	Authors
Carolina Loch	Evolution of the cetacean dentition	Oral Sciences	C Loch, JA Kieser, RE Fordyce
Colleen Murray	Anti-smoking activities of New Zealand hygienists and therapists	Oral Rehabilitation	CM Murray, JM Broadbent, KP Fernandes, JW Leichter
Alessandro Quaranta	Clinical and microbiological evaluation of dental implants with different collar treatments: a randomized clinical trial	Oral Sciences	A Quaranta, O D'Isidoro, G Rappelli, M Piemontese
Neil Waddell	Strain distribution within implant overdentures – an *in-vitro* study	Oral Rehabilitation	JHC Lee, JN Waddell, S Ma, MV Swain