



THE UNIVERSITY
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AUSTRALIA

CREATE CHANGE

School of Dentistry Research Day 2026

'Science to Advance Oral Health'



Welcome

We warmly invite you to attend the School of Dentistry's annual Research Day, a celebration of the diverse and cutting-edge research driving innovation across our discipline. From regenerative dentistry and clinical translation to oral epidemiology, public health, and dental education, the event highlights the full spectrum of our research excellence.

Research Day showcases the outstanding work of our Doctor of Clinical Dentistry (DClinDent) candidates, Higher Degree by Research (HDR) students, and academic staff. It is a dynamic forum for sharing discoveries, fostering collaboration, and strengthening connections within the dental research community and beyond.

Continuing Professional Development (CPD)

Attendees who indicate they would like CPD certificates will receive a certification for 7 hours of scientific Continuing Professional Development (CPD).



International Association
for Dental, Oral, and
Craniofacial Research

Event Information

Venue: 0881-416 ES Meyers Lecture Theatre, Mayne Medical Building
288 Herston Road, Herston QLD, 4006;
Catering in Mary Emelia Room

Date: Friday 24 July 2025

Time: 8:15am–4:20pm

Teams link: Provided to those who register and indicate online attendance (presenters must attend in person)

Contact: dentistry.researchadmin@uq.edu.au

Acknowledgements

The University of Queensland gratefully acknowledges **Colgate** and the International Association for **Dental, Oral, and Craniofacial Research** for their continued support of Research Day.

Their generous contribution plays a vital role in promoting excellence in dental research and education. We sincerely thank Colgate for their ongoing partnership and commitment to fostering innovation and academic achievement within our community.



School Address



Professor Sašo Ivanovski

Head of School

I am delighted to extend a warm welcome to the 2026 School of Dentistry Research Day. It's another year during which our school has experienced significant achievements in our research activities, spanning various established and emerging areas.

This event provides us with a valuable opportunity to come together and celebrate our research achievements, disseminate our findings to a broader audience, and encourage engagement and collaboration. It also serves as a platform to recognise and reward exceptional research conducted by our students through a series of awards.

We take pride in the consistently high quality of our oral health research, contributing to the advancement of scientific knowledge at both local and international levels. This research plays a crucial role in addressing contemporary challenges in dentistry and offering effective solutions.

I extend my heartfelt congratulations to the students and staff participating in this year's Research Day, and I hope you find inspiration in discovering the outstanding research underway at the School of Dentistry.



Professor Loc Do

Director of Research

We would like to warmly welcome you to the School of Dentistry Research Day 2026. This year's theme '**Science to Advance Oral Health**' encapsulates our vision and strategy to ensure our research has real world impact.

By focusing our research agenda through our three main research units - Population Health at UQ (POHUQ), the Centre for Orofacial Regeneration, Reconstruction and Rehabilitation (COR3) and our Clinical Research Units – we are producing world-class outcomes that are providing solutions to today's global dental health challenges.

We are fortunate to have two world-class keynote speakers at our Research Day, Professor Jason Pole and Professor Tanya Smith.

Our staff and students will also present on a wide range of research topics showcasing the depth, breadth and quality of the research being conducted at the School.

Research Day Committee



Dr PingPing Han

UQ Development Fellow
NHMRC Emerging Leadership Fellow
School of Dentistry



Prof. Ove Peters

Deputy Head of School & Professor of
Endodontics
School of Dentistry



Dr Helena Schuch

Senior Research Fellow
School of Dentistry



**Dr Manori
Dhanapriyanka**

PhD Student
School of Dentistry



Ms Alana Dorris

Senior Research Administration Officer
School of Dentistry

Keynote Speakers



Professor Jason Pole

Deputy Director of the Queensland Digital Health Centre (QDHeC), School of Medicine, Faculty of Health, Medicine and Behavioural Sciences, The University of Queensland

Title of Talk: *Innovative AI in Health: How we move from prediction to application*

Jason has a background in epidemiology, health services research and digital health with an emphasis on the use of real-world data and complex survey instruments.

Currently, Jason has research interests in the areas of digital health applications to improve system performance including patient safety, health care utilization among childhood cancer survivors, the effects of childhood cancer treatment specifically on the development of second cancers and education achievement and has interests in the financial impact of a childhood cancer diagnosis on the family and the long-term financial health of the survivor. More recently, Jason has developed an interest in adolescent and young adult oncology (AYA) survivors and the specific long-term needs of this unique cancer population.



Professor Tanya Smith

Australian Research Council Future Fellow (2021-2026). Australian Research Centre for Human Evolution & Griffith Centre for Social and Cultural Research. Griffith University.

Title of Talk: *The Secret Lives of Ancient Teeth: Development, Climate Change, and Human Evolution*

Professor Smith is a Professor in the Griffith Centre for Social and Cultural Research (GCSCR) and the Australian Research Centre for Human Evolution (ARCHE) at Griffith University. Professor Smith has previously held a professorship at Harvard University and fellowships at the Radcliffe Institute for Advanced Study and the Max Planck Institute for Evolutionary Anthropology. Prof Smith's area of expertise is the study of tooth growth and structure. Teeth preserve remarkably faithful records of daily growth, infant diet, and developmental stress for millions of years, as detailed in *The Tales Teeth Tell* — her popular science book published by MIT Press. She is also a regular contributor to *The Conversation* and ABC News Radio.

UQ Dentistry: Research Day 2026 – Program

WELCOME		
7:45- 8:15	Registration, Networking & Refreshments	30min
8:15- 8:20	Welcome Address – Deputy HoS-, Prof Ove Peters	5min
8:20- 8:25	Welcome Address – Director of Research, Prof Loc Do	5min
KEYNOTE SPEAKER		
8:30- 9:10	Professor Jason Pole: Innovative AI in Health: How we move from prediction to application	40min
SESSION 1Chair: Manori Dhanapriyanka		
9:15- 9:25	Angelique Zamora Residential Aged Care Staff's Oral Health Care Practices and Training	10min
9:25- 9:35	Bilal El Masoud Development and characterisation of self-lubricating surface coating for Ti using PEEK/PTFE copolymer	10min
9:35- 9:45	Huilin Zhu An Anatomical Geometric Framework for Single-Tooth Implant Planning	10min
9:45- 9:55	Israa Awadh From Barriers to Behaviours: Determinants of Dental Service Use Among CALD Children	10min
9:55- 10:05	William Aung LightForce® customised orthodontic brackets: a randomised controlled clinical trial	10min
10:05-10:15	Ana Beatriz Lima de Queiroz Healthy behaviours in the first 1000 days and childhood caries	10min
10:15-10:25	Lydia See Developing the Modified Oral Health Assessment Tool (M-OHAT©) Training Materials for Non-Oral Health Professionals	10min
10:30-10:55	MORNING TEA	25min
KEYNOTE SPEAKER		
11:00- 11:40	Professor Tanya Smith- The Secret Lives of Ancient Teeth: Development, Climate Change, and Human Evolution	40min
SESSION 2Chair: Pingping Han		
11:40- 11:50	Deborah Du The suitability of tooth autotransplantation for anterior teeth	10min
11:50- 12:00	Chenyi Zhang Small extracellular vesicles as osteo-immunomodulatory mediators for bone regeneration	10min
12:00- 12:10	Cong Wang Hydrogel-Based Platform for Simulating Oxygen Gradients in Periodontal Pockets	10min
12:10- 12:20	Binhphuong (Peter) Pham ARP versus USH for anterior maxillary implants: a randomised trial	10min
12:20- 12:30	Saraswat Basu 3D Bioprinted hGF-THP1 Co-culture model for LPS-induced Inflammatory response	10min
12:30- 12:40	Matthew Nangle Dental aesthetics moderates negative views of ageing and psychological distress	10min
12:45- 12:55	Colgate Presentation	10min
1:00- 1:40	LUNCH	40min

SESSION 3			Chair: Helena Schuch		
1:40- 1:50	Yue Wang Mannose Hydrogel–MOF Platform Orchestrates Immunotherapy Against Oral Squamous Cell Carcinoma		10min		
1:50- 2:00	Qiqian Yan Early Cell Adhesion on Nano-Engineered Implants: A Single-Cell Force Study		10min		
2:00- 2:10	Claudia Lopez Silva Oral care practices and respiratory tract pathogens: findings from an Australian ICU		10min		
2:10- 2:20	Thi (An) Dao Age-dependent and dose-response effects of free sugar in childhood caries		10min		
2:20- 2:30	Zhengming Tang Treg-derived Extracellular Vesicles Reprogram Immune Responses for Periodontal Regeneration		10min		
2:30- 2:40	Nadeeka Udawatte Probiotic Ecological Engineering of Periodontal Dysbiosis: Multi-Omic Evidence for 3D Polymicrobial Biofilm Reprogramming		10min		
2:40- 2:50	Vamsi Anegundi Patient-specific 3D-printed PCL Scaffolds for alveolar ridge augmentation		10min		
2:50- 3:00	Manori Dhanapriyanka Oral Health as a Component of Healthy Ageing: A Scoping Review of Australian health Policy frameworks.		10 min		
SESSION 4: Presentations, Award Announcements & Close; Chair: Prof Loc Do					
3:00-3:10	Pingping Han Salivary extracellular vesicles host methylome and microbiome in periodontitis		10min		
3:10-3:20	Nilesh Torwane Combating Misinformation in the Digital Age: A Machine Learning Approach to Protect Community Water Fluoridation and Promote Oral Health Equity		10min		
3:20-3:30	Lyndal Pritchard Bridging evidence to practice: A co-designed implementation blueprint for oral health assessment in Australian Residential Aged Care		10 min		
3:30-3:40	Man Bui Income- and education-related inequalities in dental visits by remoteness		10 min		
3:40- 4:00	Award Presentations		15min		
		Publication Awards - Clinical Research - Dental Education & Public Health			
		Supervisor Award			
		Presentation Awards - Head of School Award - IADR Travel Awards - Postgraduate Presentation Awards - Staff Presentation Award			
4:00	CLOSE & AFTERNOON TEA				20 min



Research Day Awards 2026

(awarded at event conclusion)

Presentation Awards

- Head of School Excellence in Research Award
- IADR Travel Awards
- Postgraduate Presentation Awards
- Staff Presentation Award

Publication Awards

- Clinical Research Award
- Dental Education & Public Health Award

Supervisor Award

- For outstanding research supervision in 2025/26

Research Day 2025 Awardees

Presentation Awards 2025

Best Overall Presentation:

Jenny Wang

Most Innovative & Impactful Presentation:

Jenny Wang

Best Undergraduate Presentation:

Sandi Abdoni and research team

Best Postgraduate Presentations:

Jenny Wang (DClinDent)

Lyndal Pritchard (HDR)

Publication Awards 2025

Clinical Research & Regenerative Medicine check:

An Thi Minh Dao

Dental Education & Public Health check:

Chun Liu

Dental Education & Public Health check:

Enmao Xiang

IADR Conference Awards 2025

Senior: Joyce Wong

Junior: Sandi Abdoni and Research Team

Staff Supervisor Award 2025

Dr. Pingping Han

Runner up-Dr. Nicole Stormon

Publications – Publication Award Nominees

Clinical Research Publications

Lopez, Claudia

ScholarOne Manuscripts ; Manuscript ID CCSCI-2025-0397.R3 ; Journal Critical Care Science (not available yet)

Wang, Jenny

Effect of Periodontal Therapy on Salivary Extracellular Vesicle Cargos: An Exploratory Study - Wang - 2026 - Journal of Clinical Periodontology - Wiley Online Library

Udawatte, Jenny

Full article: Transient restructuring of the active oral resistome during probiotic Streptococcus salivarius K12 colonization in a 3D polymicrobial biofilm model

Dental Education & Public Health

Thi (An) Dao

Translating Observational Data Into Public Health Action: Reducing Early Childhood Caries Burden Related to Socioeconomic Disparities - Dao - Community Dentistry and Oral Epidemiology - Wiley Online Library

Nilesh Torwane

Tracking the Debate: Geo-Temporal Sentiment Analysis of Community Water Fluoridation on 'X' (Formerly Twitter) With Five-Year Forecast - Torwane - 2026 - Community Dentistry and Oral Epidemiology - Wiley Online Library

Presentation Abstracts

Residential Aged Care Staff's Oral Health Care Practices and Training

Researcher/s: Angelique Zamora

Supporting Researchers: Dr Lori Delaney, Dr Kristiana Ludlow, Professor Loc Do

Aims/Objectives

Approximately one in five aged care residents experience oral health problems [1]. While training residential aged care staff in oral healthcare may address this issue, uptake of available training in Australia remains unclear.

Additionally, there is a lack of contemporary studies exploring oral health care practices or training among residential aged care staff in Australia. The objective of this study is to gain insight into the current state of oral health care practices and training in residential aged care.

Methods

A qualitative study using semi structured, one on one interviews was conducted to explore residential aged care staff perspectives on oral health training and practices. Participants (n = 16) were purposively sampled from facilities across Queensland and New South Wales, representing a range of roles. Interviews were conducted, transcribed verbatim, and analysed using inductive content analysis.

Results

Residential aged care staff reported minimal or no oral health care training and were unaware of available training. Staff reported “learning on-the-job”, “winging” oral health care, and having little to no confidence providing oral health care. Other reported barriers included perceived difficulty in providing oral care for residents living with cognitive impairment or changed behaviours, and limited access to required equipment (e.g., light, tongue depressors and dental mirrors). Potential training implementation strategies suggested by staff included embedding oral health assessments within “Resident of the day” and providing regular (e.g., annual) training on oral health care.

Conclusions

Limited oral care training contributes to a lack of knowledge and confidence in being able to conduct oral health care in residential aged care. Training should include guidance in providing oral health care to residents with cognitive impairment and changed behaviours. Future studies should incorporate implementation strategies informed by residential aged care staff to increase the uptake of training and improve adoption of oral health care into practice.

Reference

1. Caughey, G.E., et al., *The oral health care needs of people living in residential aged care, Australia, 2016–20: a retrospective cross-sectional study*. Medical Journal of Australia, 2025. **222**(6): p. 318–320. <https://onlinelibrary.wiley.com/share/KH9XJHCY8ZVW4IXU2BCB?target=10.5694/mja2.52625>

Development and characterisation of self-lubricating surface coating for Ti using PEEK/PTFE copolymer

Researcher/s: Bilal El Masoud

Supporting Researchers: Ryan Lee, Sašo Ivanovski, Abdalla Abdal-hay

Background

Titanium (Ti) and its alloys are the gold standard for orthopaedic and dental implant materials; however, these materials have limited wear resistance. Therefore, it is essential to develop a proper method to overcome these limitations.

Aims/Objectives

The aim of this study is to develop a coating layer on Ti surface with a self-lubricating characteristic.

Methods

A novel coating approach for the development of a PEEK/PTFE composite using PVA as a capping agent, by using drop-casting, was achieved. The PEEK/PTFE composite particles suspended in PVA solutions of different concentration (0.5%, 0.3% and 0.1%) were dispensed onto Ti surface to form a uniform coating film. PEEK/PTFE-PVA composite coatings were heat-treated at 400 °C for 20 minutes holding time. The samples were characterised using scanning electron microscopy, atomic force microscopy, Fourier transform infrared spectroscopy, X-ray diffraction analysis, thermogravimetric analysis and differential scanning calorimetry. The coefficient of friction of the coated and uncoated samples were also assessed using a ball-on-disc tribometer.

Results

The results showed that at different PVA solution concentrations, a uniform, continuous and dense films were formed on Ti surface. All coatings, irrespective of the PVA concentration, generated a COF that ranged between 0.08 and 0.1, which was significantly less than the uncoated Ti surface (0.67). The use of 0.1% PVA concentration provided the highest surface characteristics, including the least residue remnants, the lowest COF (0.084), and low surface roughness ($< 0.45\mu\text{m}$). The 0.5% PVA concentration induced high crystallinity of the composite coating at the expense of the COF of the coating and the amount of residue.

Conclusions

The presented technique of drop-coating facilitated the development of a reliable self-lubricating PEEK/PTFE coating over commercially pure Ti.

An Anatomical Geometric Framework for Single-Tooth Implant Planning

Researcher/s: Huilin Zhu

Supporting Researchers: Zilong Zeng, Yinghong Zhou, Zhihui Tang, Hongyang Ma

Aims/Objectives

Dental implant planning requires careful integration of clinical expertise and anatomical constraints. This study developed an explainable artificial intelligence (XAI) framework for automated single-tooth implant planning from cone-beam computed tomography (CBCT) images to improve transparency, interpretability, and clinical trust by explicitly separating anatomical perception from decision-making.

Methods

A hybrid planning framework was established in which deep learning was used exclusively for 3D anatomical segmentation of the maxilla, mandible, teeth, and mandibular nerve canal. Implant planning was subsequently performed using a transparent geometric reasoning engine comprising three stages: (i) patient-specific dental arch reconstruction using weighted principal component analysis, (ii) extraction of a surgically relevant region of interest (ROI), and (iii) optimisation based on clinical guidelines. The optimisation enforced safety margins of ≥ 1.5 mm from adjacent teeth, ≥ 2.0 mm from the inferior alveolar nerve, ≥ 2.0 mm buccal bone thickness, and ≥ 1.0 mm lingual bone thickness. The framework was validated using retrospective CBCT datasets from 20 patients with diverse single-tooth defects. Performance was assessed through geometric accuracy, compliance with clinical safety boundaries, Expert Clinical Rating (ECR), and a double-blind Turing-style evaluation.

Results

The framework achieved high agreement with expert-generated plans, yielding a mean centroid deviation of 1.598 mm and an angular deviation of 7.158° . All implant plans satisfied predefined clinical safety requirements and showed no significant differences from expert plans ($p > 0.05$). Evaluation by five experienced implant surgeons demonstrated high clinical acceptability (ECR $\geq 3/5$) with excellent inter-rater reliability (ICC = 0.859). In the double-blind Turing-style assessment, experts achieved an overall classification accuracy of 0.44 (AUC = 0.417), indicating that AI-generated plans were largely indistinguishable from those produced by human experts.

Conclusions

The XAI framework delivers clinically relevant implant planning performance and maintains fully interpretable decision pathways. By combining deep learning-based anatomical perception with transparent rule-based geometric reasoning, the system offers a trustworthy foundation for human-AI collaboration in implant dentistry.

From Barriers to Behaviours: Determinants of Dental Service Use Among CALD Children

Researcher/s: Israa Awadh

Supporting Researchers: Nisar M, Nickbakht M, Ball L, Khan A, Zafar S

Aims/Objectives

Culturally and linguistically diverse (CALD) families in Australia face persistent barriers to dental care [1], yet child-specific evidence on sector use is limited, with no prior large CALD sample. This study examined barriers, enablers and sociodemographic characteristics associated with children's dental service use among CALD caregivers in Queensland.

Methods

CALD caregivers of children aged under 18 years were surveyed cross-sectionally across Queensland, November 2024 to August 2025. A37-item questionnaire developed using the Capability, Opportunity, Motivation-Behaviour (COM-B) framework, measured barriers, enablers and recent care experiences. Multinomial logistic regression examined associations between factors from exploratory factor analysis, sociodemographic covariates and service-use type (private, public or mixed-sector), with public-only as reference. Variables not associated at $p < 0.20$ were removed, leaving four factors and selected covariates, three significantly associated with service-use type.

Results

In total, 385 caregivers participated. Factor analysis identified seven factors. Relative to public-only use, private-only use was not associated with any factor but was associated with higher English proficiency (very well: OR = 5.65, 95% CI [2.01, 15.88]; well: OR = 2.79, 95% CI [1.03, 7.61]), private dental insurance (OR = 4.91, 95% CI [2.66, 9.09]) and employer-based dental insurance (OR = 4.84, 95% CI [1.25, 18.73]). Mixed-sector use was associated with fewer structural and provider barriers (OR = 0.82, 95% CI [0.69, 0.96]), lower dissatisfaction and non-attendance (OR = 0.62, 95% CI [0.42, 0.91]) and stronger valuing of cultural and linguistic enablers (OR = 1.41, 95% CI [1.01, 1.97]). Neither English proficiency nor insurance was significant for mixed-sector use.

Conclusions

Dental service use among CALD families is shaped by pre-existing resources, including dental insurance and English proficiency, as well as by care experiences across both sectors. Improving equitable access requires addressing structural and financial barriers while embedding culturally and linguistically responsive care across all dental service settings.

LightForce® customised orthodontic brackets: a randomised controlled clinical trial

Researchers: William Aung

Supporting Researchers: Dr Elissa Freer, Dr Desmond Ong, A/Prof Maurice Meade, Dr Peter Miles, Dr Kate Barker

Aims/Objectives

LightForce is a recently developed 3D-printed customised orthodontic bracket system. A small number of retrospective studies have reported that LightForce can reduce overall treatment times and the number of appointments required to achieve high-quality treatment outcomes.^{1,2} The aim of this 2-arm randomised controlled clinical trial (RCT) is to compare the efficiency and effectiveness of LightForce customised brackets and conventional pre-adjusted brackets with respect to initial mandibular anterior alignment, the number of bracket failures and levels of patient discomfort.

Methods

60 patients requiring mixed orthodontic appliance treatment participated in this RCT. They were recruited from a single private practice and treated by 2 experienced orthodontists. Randomisation was performed with permuted blocks of 4, 6 or 8 patients assigned to either the LightForce or conventional pre-adjusted group with allocations concealed in opaque, sealed envelopes. The primary treatment outcome measured was the rate of improvement of Little's Irregularity Index (LII) in the mandibular arch over the first 12 weeks of treatment. Secondary outcomes included the number of bracket failures during the same timeframe and a survey of each patient's perceived discomfort, measured with an 11-point Numerical Rating Scale (NRS).

Results

There was no significant difference between the two treatment groups (mean -0.003; 95% CI -0.019, 0.013; $p=0.71$) with respect to the rate of mandibular LII improvement during the first 12 weeks. Additionally, there was no significant difference in the number of bracket failures over the first 12 weeks (mean 1.58; 95%CI 0.90, 2.76; $p=0.10$), or in patient discomfort (mean -0.66; 95% CI -1.50, 0.18; $p=0.123$).

Conclusions

There was no significant difference between the LightForce customised bracket system and a conventional pre-adjusted bracket system over the first 12 weeks of orthodontic treatment, when measuring the rate of mandibular anterior tooth alignment, recording the number of bracket failures, or initial patient discomfort.

References

1. Waldman A, Garvan, Cynthia, Yang, Joshua, Wheeler, Timothy. Clinical Efficiency of LightForce 3D-Printed Custom Brackets. Journal of Clinical Orthodontics. 2023;57(5):274-82.
https://www.jco-online.com/media/41976/2023_05_274_waldman.pdf
2. Wheeler T, Garvan C, Waldman A, Ford J. Clinical Efficiency of LightForce 3D-Printed Custom Brackets in Diverse Practice Settings. Journal of Clinical Orthodontics. 2024;58(5):273-82.
https://www.jco-online.com/media/43897/2024_05_273_wheeler.pdf

Healthy behaviours in the first 1000 days and childhood caries

Researcher/s: Ana Beatriz Lima de Queiroz

Supporting Researchers: Helena Silveira Schuch, Diep Ha, Loc Do, Flávio Fernando Demarco, Marcos Britto Corrêa

Aims/Objectives

To investigate the association between health behaviour patterns during the first 1000 days of life and early childhood caries, beyond the influence of socioeconomic conditions.

Methods

This study used data from the 2015 Pelotas Birth Cohort, Brazil. Exposure variables included 12 indicators of behaviours during the first 1000 days of life, collected across five follow-ups from pregnancy to 24 months, such as physical activity during pregnancy, parent-child interactions, and breastfeeding patterns. Exposure patterns were identified using Latent Class Analysis (LCA), and a constructed index with higher scores meaning worse levels. The outcomes were Early Childhood Caries (ECC) and Severe-ECC (S-ECC) at age 4, measured through clinical examinations.

Associations between exposures and outcomes were examined using Poisson regression models with robust variance, adjusting for maternal age and education, and household income at birth. Results are presented as adjusted prevalence ratios (PRs) with 95% confidence intervals (95% CI).

Results

The LCA included 3,645 participants, identifying Class 1 (n = 1,857; 50.95%), characterized by more favourable health behaviours, and Class 2 (n = 1,788; 49.05%), representing less favourable behaviours. The score index analysis included 2,243 participants (median 8; SD 2.04). In the LCA model, Class 2 was significantly associated with higher caries risk compared to Class 1, including ECC (PR = 1.35; 95% CI: 1.22-1.49) and S-ECC (PR = 1.56; 95% CI: 1.34-1.82). A dose-response relationship was observed between higher exposure scores and increased caries prevalence. The highest tercile showed increased prevalence of ECC (PR = 1.27; 95% CI: 1.11-1.45) and S-ECC (PR = 1.39; 95% CI: 1.13-1.71), compared with the lowest tercile.

Conclusions

The exposure index and LCA demonstrated consistent associations between behaviour patterns and caries in early childhood. The results suggested that promoting and supporting parents' adherence to positive health behaviours during this critical period positively impacts oral health.

Developing the Modified Oral Health Assessment Tool (M-OHAT®) Training Materials for Non-Oral Health Professionals

Researcher/s: Lydia See

Supporting Researchers: Ha, Diep; Walsh, Laurence J; Fung, Cheuk Kee C.; Schuch, Helena; Lopez Silva, Claudia P.; Pritchard, Lyndal; Zamora, Angelique; Tran, Ngoc Kien; Khan, Sadaf; Le, Thu; Do, Loc

Aims/Objectives

The Modified Oral Health Assessment Tool (M-OHAT®) supports non-oral health professionals in identifying oral health issues and determining referral needs. However, effective implementation requires staff to understand basic normal oral conditions and changes. This study aimed to develop and critically design training materials tailored to residential aged care facility (RACF) staff, accounting for workload constraints, limited oral health training, and adult learning principles.

Methods

Training materials were developed using cognitivism, experiential learning, and self-directed learning frameworks to maximise usability. A dual-component structure was employed. The theoretical component addressed M-OHAT domains, including normal findings, indicators for monitoring, and referral thresholds. The practical component focused on real-world application in RACFs, incorporating infection control, ergonomics, oral hygiene, denture care, and intraoral assessment techniques. Content was delivered through short (1–6 minutes) video modules using real clinical images and demonstrations. Development involved specialist input from special needs dentistry and population oral health, including videography and photography sessions, followed by iterative review with the research team and RACF staff to ensure usability.

Results

A total of 22 modular videos delivered via the PADLET platform supported flexible, self-directed learning. The design demonstrated alignment with adult learning principles through concise, segmented content, multimodal delivery (visual, audio, subtitles), and clinically relevant demonstrations. Iterative feedback allowed improved clarity, usability, and relevance to daily care practices. The format allowed staff to learn at their own pace, revisit content, and develop an understanding of recognising normal and abnormal oral findings.

Conclusions

The development of M-OHAT training materials required a targeted, theory-informed approach that prioritised usability, accessibility, and clinical relevance within RACF settings. This training material demonstrated that embedding adult learning principles and iterative feedback can produce a practical and contextually appropriate training solution. Future research will formally evaluate its effectiveness in improving knowledge, clinical application, and uptake of the M-OHAT tool.

The suitability of tooth autotransplantation for anterior teeth

Researcher/s: Deborah Du

Supporting Researchers: Dr Elissa Freer, Dr Jen-Ti Hsieh, Dr Hisham Mohammed, Dr Desmond Ong

Background

Tooth autotransplantation is a procedure utilised for replacing compromised, malformed or avulsed anterior teeth, as well as ectopic canines.^{1,2}

Aims/Objectives

The first aim was to investigate clinical outcomes of teeth transplanted into the anterior maxilla and mandible, including success and survival rates. The second aim was to investigate patient-reported outcome measures (PROMs) of satisfaction, appearance, comfort, and function of teeth transplanted into the anterior maxilla and mandible.

Methods

Patients treated between 2020-2024 into the anterior maxilla (13 to 23) or mandibular region (33-43) were invited to participate in the study. Participants were recruited from public and private clinics, and were treated by a single oral maxillofacial surgeon. Clinical and radiographic examination was conducted to assess the health and appearance of the transplant. Participants were given a six-item 100mm visual analogue scale questionnaire.

Results

A total of 25 patients with 31 transplants were recruited for the study. The survival and success rates were 100% and 93.5% respectively, after an average follow-up time of 2 years and 6 months. One of the failures was from ankylosis (3.2%) and the other from invasive cervical resorption (3.2%). Aesthetically, most transplants were of a normal colour (90.3%). Most transplants (90.3%) had normal periodontium and soft tissue morphology, including normal interdental papillary height. Transplants with open apices had a higher success rate (95.5%) compared with closed apex cases (88.9%). The overall satisfaction with the transplants was rated at 94 out of 100. When rating the appearance of the tooth and gums, the average ratings, were 88 out of 100 and 92 out of 100 respectively.

Conclusions

Autotransplants into the anterior aesthetic region can be a highly predictable and aesthetic treatment option for patients with severely compromised, malformed, missing, or ectopic teeth. Overall, patients reported high satisfaction with the aesthetics and function of their transplanted tooth.

References:

1. Natiella JR, Armitage JE, Greene GW. The replantation and transplantation of teeth: A review. *Oral Surgery, Oral Medicine, Oral Pathology*. 1970;29(3):397-419.
2. Ong DV, Goh P, Dance G. Anterior tooth autotransplantation: a case series. *Australian dental journal*. 2023;68(3):202-215.

Small extracellular vesicles as osteo-immunomodulatory mediators for bone regeneration

Researcher/s: Chenyi Zhang

Supporting Researcher: Pingping Han

Aims/Objectives

Bone defects remain a major clinical challenge due to their limited self-repair capacity. Small extracellular vesicles (sEVs) act as intercellular communication with low immunogenicity, making them attractive candidates for regenerative applications [1,2]. Therefore, exploring sEVs secreted by immune cells and bone cells is crucial for developing alternative cell-free approaches, particularly when combined with advanced biomaterial delivery systems. This study aims to explore the regenerative potential of sEVs derived from osteoblasts (hFOB) and monocytes (THP-1) in vitro, hypothesising that dual sEVs could promote bone regeneration by enhancing osteogenesis, angiogenesis and immunomodulation processes.

Methods

Small extracellular vesicles were isolated using size exclusion chromatography and characterised following the MISEV 2023 guidelines [3]. Their individual and combined biological functions were assessed using osteogenic differentiation, endothelial tube formation, and macrophage polarisation assays. Afterwards, dual sEVs were loaded into casted hydrogel scaffolds with living cells to evaluate their function on 3D cultured cells.

Results

The results demonstrated that dual sEVs significantly enhanced osteogenic activity in hFOBs, evidenced by stronger alkaline phosphatase (ALP) and Alizarin Red S (ARS) staining, together with increased osteogenic gene expression. In addition, angiogenesis was promoted by enhancing tube formation in human umbilical vein endothelial cells (HUVEC) and increased immunofluorescent density of von Willebrand factor (vWF). As for immunomodulatory potential, dual sEVs showed the capacity to lower pro-inflammatory cytokines (Tumor necrosis factor- α , Interleukin 6 and Interleukin-1 β) in M1 macrophages. A sustained sEV release from hydrogel scaffolds was observed for up to 14 days, and the osteoblast cells incorporated in the scaffolds showed a higher level of osteogenic gene expression at the timepoints of 4h and 24h after the sEVs treatment.

Conclusions

This study highlights the potential of monocytes- and osteoblasts-derived sEVs as multifunctional bioactive agents for bone regeneration, also contributes to the growing understanding of sEVs-based cell-free regenerative therapies for tissue engineering.

References

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Hydrogel-Based Platform for Simulating Oxygen Gradients in Periodontal Pockets

Researcher/s: Cong Wang

Supporting Researchers: Tian Xu, Louis Jun Ye Ong, Jaya Seneviratne, Yinghong Zhou

Aims/Objectives

Periodontitis is a chronic inflammatory disease that poses significant risks to both oral and systemic health. Traditional *in vitro* models fall short in replicating the complexity of the oral microbiome and microenvironment within periodontal pockets. This study aims to develop a hydrogel-based platform using granular hydrogel to locally regulate oxygen tension, mimicking the unique conditions of periodontal pockets.

Methods

Granular hydrogel was synthesised by dispensing carbomer in a liquid medium to form a semi-solid, gel-like matrix. The hydrogel platform's rheological properties, mass transport capabilities, and oxygen regulation potential were characterised to assess the feasibility of constructing this model. Biocompatibility was evaluated using OD₆₀₀ measurements and Live/Dead assays observation of *P. gingivalis* cultured within the hydrogel. The *P. gingivalis* -macrophage co-culture model was 3D printed (**Figure 1**). The inflammatory response of macrophage to *P. gingivalis* was evaluated using RT-qPCR and ELISA.

Results

The granular hydrogel exhibited rheological and mass transport properties suitable for constructing a semi-solid *in vitro* model, facilitating material exchange and oxygen gradient formation. Biocompatibility tests confirmed that the granular hydrogel supports anaerobic species like *P. gingivalis* growth. Co-culture experiments confirmed the platform's capacity to control localised oxygen levels, effectively recreating the gradients found in periodontal pockets.

Conclusions

This study highlights the potential of the granular hydrogels to simulate the complex oxygen environments of periodontal pockets, offering a cost-effective tool for studying periodontitis. Furthermore, this platform holds promise for developing pathological models, advancing clinical diagnostics, and enabling novel therapeutic approaches.

Arp versus USH for anterior maxillary implants: a randomised trial

Researcher/s: Binhphuong (Peter) Pham

Supporting Researchers: Jamil Alayan, A/Prof Ryan Lee

Aims/Objectives

Following tooth extraction, alveolar ridge remodelling can compromise implant placement and aesthetics in the anterior maxilla. This randomised controlled trial compared alveolar ridge preservation (ARP; Type IV placement) with unassisted socket healing (USH; Type II early placement) [1] for single anterior maxillary implants across hard-tissue, surgical, patient-reported and aesthetic outcomes.

Methods

Patients requiring a single implant replacing an anterior maxillary tooth (13-23) were randomised after extraction to ARP (Bio-Oss Collagen, sealed with a collagen matrix; implant at 12-16 weeks) or USH (no graft; implant at 6-8 weeks). Hard-tissue change was assessed on cone-beam computed tomography (CBCT) [2] (horizontal ridge width at 1, 3 and 5 mm; mid-buccal and mid-palatal height) using linear mixed models. Operative time, biomaterial volume, primary stability and guided bone regeneration were recorded. Patients completed 14-day recovery diaries (function, symptoms, pain, OHIP-14). Pink and white esthetic scores (PES/WES) [3] were rated at delivery and one year.

Results

The groups were well matched at baseline. Ridge dimensions changed substantially over time (all $p < 0.001$), but the group-by-timepoint interaction was non-significant for every measure; treatment group was significant only for mid-buccal height (higher in ARP, $p = 0.023$). No dimensional-change delta differed between groups. The protocols differed mainly in surgical process: ARP took longer at extraction and grafted then, whereas USH grafted more at placement, with no difference in total operative time or biomaterial. Primary stability was 100% in both groups. Recovery was driven by surgery type rather than group, and PES/WES were equivalent at one year.

Conclusions

ARP and USH produced comparable hard-tissue, patient-reported and aesthetic outcomes for anterior maxillary implants, differing chiefly in the timing and distribution of grafting rather than in total surgical burden or final clinical result.

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3D Bioprinted hGF-THP1 Co-culture model for LPS-induced Inflammatory response

Researcher/s: Saraswat Basu

Supporting Researchers: Prof Saso Ivanovski, Dr. Pingping Han, Dr. Reuben Staples and Kanchan Vaswani

Aims/Objectives

This study aimed to develop a 3D bioprinted stromal co-culture model containing human gingival fibroblasts (hGFs) and THP-1-derived macrophages to investigate lipopolysaccharide (LPS)-induced inflammatory responses.

Methods

GelMA bioinks were optimised for extrusion bioprinting using a Cellink BIOX system. A 7% (w/v) GelMA formulation with 0.15% (w/v) LAP was selected for optimal printability and scaffold stability, with printing parameters and nozzle sizes refined to improve post-printing cell recovery. A two-cell stromal model was established by embedding hGFs and PMA-differentiated M0 macrophages within the scaffolds. Inflammation was induced using *E. coli* and *P. gingivalis* LPS, and cellular responses were assessed via ELISA, confocal microscopy, and flow cytometry. Model anti-inflammatory responsiveness was evaluated using ibuprofen.

Results

The optimised GelMA bioink enabled stable scaffold fabrication with high print fidelity. Larger nozzle sizes significantly improved post-print cell recovery, with recovery exceeding 94% for both cell types. Confocal imaging confirmed long-term cell viability, spatial organisation, and sustained co-culture within the scaffold. Elevated basal cytokine release was observed immediately after printing, which decreased following a three-day equilibration period. LPS stimulation significantly increased IL-6 secretion compared with control and ibuprofen-treated groups ($p < 0.05$), confirming induction of an inflammatory response. Ibuprofen treatment reduced inflammatory cytokine expression, supporting the functional responsiveness of the model.

Conclusions

This study successfully established a 3D bioprinted stromal microenvironment that supports long-term viability and biologically relevant inflammatory responses. The model provides a robust platform for investigating oral inflammation and lays the foundation for incorporating epithelial and vascular components to develop a more physiologically representative oral mucosal model.

Dental aesthetics moderates negative views of ageing and psychological distress

Researcher/s: Matthew Nangle

Supporting Researchers: Brett Kerr, Julie Henry & Sarah Coundouris

Aims/Objectives

Positive body image has been shown to buffer the connection between broader ageist attitudes and psychological wellbeing in late adulthood. An important aspect of body image often overlooked in this age group is how attractive and healthy one's teeth appear. Age-related declines in oral health negatively impact orofacial appearance and are also associated with poorer mental health. The aim was to test whether dental aesthetics also moderates the relationship between negative views of one's own ageing and psychological distress.

Methods

A representative sample of 604 adults with the same proportion as the national United Kingdom population across three core demographics (age, sex, ethnicity) completed a survey that included validated measures of subjective age, body image (Body Appreciation Scale-2), psychological distress (Hospital Anxiety & Depression Scale), and dental aesthetics (Psychosocial Impact of Dental Aesthetics Questionnaire).

Results

Correlational and moderation analyses revealed that, as predicted, not only was holding more negative views of one's own ageing linked to poorer mental health, but this relationship was moderated both by body image in general, and dental aesthetics specifically. Thus, the adverse association between age-based self-perceptions and mental health was strongest for those who held a poorer body image, and/or who reported more negative perceptions about their orofacial appearance.

Conclusions

How attractive or healthy one's teeth appear meaningfully contributes to self-esteem and self-worth in adulthood. The current study reveals that this aspect of body image remains important in late adulthood, and interacts with, and potentially amplifies, more negative views of one's own ageing.

Mannose Hydrogel–MOF Platform Orchestrates Immunotherapy Against Oral Squamous Cell Carcinoma

Researcher/s: Yue Wang

Supporting Researchers: Yinghong Zhou, Peter Reher, Tianjun Lan

Aims/Objectives

To develop an injectable mannose-based supramolecular hydrogel incorporating Cu/DOX/MSA-2 nanoparticles for localised chemo-immunotherapy of oral squamous cell carcinoma (OSCC).

Methods

A mannose-functionalised supramolecular hydrogel loaded with Cu/DOX/MSA-2 nanoparticles was fabricated and characterised for morphology, composition, rheological properties, reactive oxygen species (ROS) generation and pH-responsive drug release. Antitumour and immunomodulatory effects were evaluated using OSCC cell lines, macrophages, and patient-derived tumour organoids through assays of cytotoxicity, oxidative stress, DNA damage, migration, immunogenic cell death (ICD), STING pathway activation and macrophage polarisation. Therapeutic efficacy and biosafety were further evaluated in an orthotopic OSCC mouse model.

Results

The hydrogel exhibited favourable injectability, sustained local retention and acidic tumour microenvironment-responsive release of Cu²⁺, doxorubicin and MSA-2. Treatment significantly increased intracellular ROS levels, disrupted redox homeostasis, and induced γ-H2AX-associated DNA damage, resulting in significant inhibition of OSCC cell viability, migration and tumour organoid growth. Enhanced calreticulin exposure together with HMGB1 and ATP release confirmed robust ICD induction. MSA-2 activated STING signalling, while mannose-mediated targeting reduced immunosuppressive M2 polarisation. In vivo, the hydrogel significantly suppressed orthotopic tumour growth and metastatic progression, increased antitumour immune cell infiltration and prolonged survival without detectable systemic toxicity.

Conclusions

This multifunctional hydrogel synergistically combines copper-mediated oxidative stress, chemotherapy, ICD induction, STING activation and macrophage reprogramming to remodel the tumour immune microenvironment and suppress OSCC progression, providing a promising strategy for localised immunotherapy of OSCC.

Early Cell Adhesion on Nano-Engineered Implants: A Single-Cell Force Study

Researcher/s: Qiqian Yan

Supporting Researchers: Sašo Ivanovski, Karan Gulati

Aims/Objectives

Dental implant surface topography plays a critical role in regulating tissue integration, beginning with the initial cell–surface interactions following implantation. Nano-engineered implants have shown potential to enhance cellular responses; however, the mechanisms underlying initial cell adhesion on these surfaces remain unclear. This study aims to investigate initial cell adhesion on nano-engineered titanium (Ti) implants using Single-Cell Force Spectroscopy (SCFS) via Atomic Force Microscopy (AFM), and to explore the relationship between initial adhesion events and cell mechanics.

Methods

Ti dental implants were nano-engineered using electrochemical anodisation to fabricate various nanotopographies, which were characterised for their physicochemical properties. Initial cell-surface interactions on anodised, micro-machined (Micro Ti) and randomly rough (Rough Ti) Ti surfaces were performed using AFM-SCFS. Adhesion force and work of adhesion during the initial adhesion phase were quantified from force-distance curves.

Results

SCFS quantified the earliest adhesive interactions between individual cells and Ti surfaces. Anodised surfaces enhanced initial cell-surface engagement compared with micro- and rough-Ti, reflected by higher adhesion force and work of adhesion from force-distance curves.

Conclusions

This study shines light on how a nanoscale-modified dental implant surface regulates initial cell–implant interactions. By linking single-cell adhesion mechanics with cell bioactivity responses in vitro and in vivo, the findings may guide the design of novel implant surfaces that accelerate implant integration and improve clinical performance.

Oral care practices and respiratory tract pathogens: findings from an Australian ICU

Researcher/s: Claudia Lopez Silva

Supporting Researchers: Sašo Ivanovski, Kelsey Pateman, Jessica Ingleman, Helena Schuch, Laurence J. Walsh

Background

Aspiration of oral pathogens from dental plaque into the respiratory tract may contribute to infection (1). However, there is limited evidence regarding the impact of routine oral care on the respiratory bacterial profile of patients on mechanical ventilation.

Aims/Objectives

To evaluate how variation in oral care delivery affects the presence of respiratory tract pathogens identified in endotracheal aspiration (ETA) cultures.

Methods

A population-based retrospective longitudinal study was conducted using clinical data from patients aged ≥ 18 years admitted to the Royal Brisbane and Women's Hospital Intensive Care Unit between January and June 2021 who required mechanical ventilation. Inclusion required at least two ETA samples to provide exposure-outcome temporality.

Exposure variables included oral care practices: chlorhexidine rinses, sodium bicarbonate rinses, and toothbrushing. Outcomes were assessed at two time points (first and second ETA) and included microorganism identification (Gram stain and culture) and semiquantitative leukocyte and epithelial cell counts. Microorganisms were classified as pathogenic or normal flora.

A directed acyclic graph informed the analysis (Figure 1)⁽²⁾. Log Poisson regressions were used to estimate crude and adjusted prevalence ratios, overall and stratified by anticholinergic medications intake.

Results

157 participants were included; 69.4% were non-operative admissions. Mean ICU stay was 11.8 days, 93.6% were intubated ≥ 48 hours, and ICU mortality was 14.7%. Paraffin lip care was the most frequently performed practice.

Gram-negative bacilli increased between ETA samples. Culture results showed increases in pathogenic organisms. Chlorhexidine use below recommendations was associated with a higher prevalence of pathogens (PR 1.24; 95% CI: 0.54–2.84), while use above recommendations showed a lower prevalence (PR 0.88; 95% CI: 0.36–2.16); however, these associations did not reach statistical significance.

Conclusions

No independent association was observed between oral care practices and respiratory pathogens in patients on mechanical ventilation, possibly reflecting multifactorial colonisation and limited statistical power in this single-centre study.

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Age-dependent and dose-response effects of free sugar in childhood caries

Researcher/s: Thi (An) Dao

Supporting Researchers: Loc Do, Diep Ha

Background

The World Health Organization recommends limiting free sugar intake (FSI) to <10% and ideally <5% of estimated energy requirement, yet the long-term effects of sustained adherence to these thresholds on childhood caries remain unclear. Although early-life reductions in FSI have been shown to reduce caries at age 5, the impact of sustained restriction throughout early childhood has not been evaluated.

Aims/Objectives

This study estimated the effects of maintaining FSI below these thresholds from ages 1-5 years on caries outcomes (severity and prevalence) up to age 7 to identify optimal timing and threshold for prevention.

Methods

Data from 2,183 Australian children born in South Australia (2013-2014) were analysed. Counterfactual caries trajectories under sustained FSI <10% and <5% were estimated and compared with observed data using parametric g-computation with 500 Monte Carlo simulations. Intervention effects were evaluated across four indicators: caries trajectories, absolute reductions, relative reductions, and velocities of caries accumulation.

Results

Sustained FSI reduction across childhood consistently lowered caries severity and prevalence trajectories, demonstrating a clear dose-response relationship, with the <5% scenario producing greater reductions than <10%. Intervention effects also showed a pronounced age-dependent pattern, with absolute and relative reductions greatest at age 2 and progressively attenuating with age. By age 7, the <5% scenario achieved substantially larger and more sustained benefits than <10% threshold, particularly for prevalence (14.62% vs 1.99% relative reduction). The velocity of dmfs accumulation was reduced under both FSI thresholds across developmental periods, although statistical significance was observed only during ages 2-5 years. In contrast, the velocity of prevalence increase decreased during ages 2-5 years but reversed during ages 5-7 years.

Conclusions

The dose-response and age-dependent patterns identify early childhood, particularly ages 2-5 years, as a critical window for intervention. Achieving FSI <5% appears necessary to obtain sustained reductions in caries prevalence in early school age population.

Treg-derived Extracellular Vesicles Reprogram Immune Responses for Periodontal Regeneration

Researcher/s: Zhengming Tang

Supporting Researchers: Tian Xu, Cong Wang, Pingping Han, Sašo Ivanovski, Yinghong Zhou

Aims/Objectives

Periodontitis is a prevalent chronic inflammatory disease characterised by dysregulated immune responses and progressive destruction of tooth-supporting tissues (1, 2). Current therapies primarily focus on controlling bacterial infection but do not adequately restore immune homeostasis to promote tissue regeneration (3). Regulatory T cells (Tregs) play a critical role in maintaining immune tolerance and resolving inflammation. Emerging evidence suggests that Tregs exert many of their immunomodulatory functions through the secretion of extracellular vesicles (EVs), which deliver bioactive cargo to recipient cells. As a cell-free therapeutic approach, Treg-derived EVs (Treg-EVs) offer significant translational potential for immune modulation and tissue repair. This study investigated the immunoregulatory and regenerative potential of human Treg-EVs for periodontal regeneration.

Methods

Treg-EVs were isolated from human CD4⁺CD25⁺CD127⁻ regulatory T cells and characterised by transmission electron microscopy and nanoparticle tracking analysis. Their biocompatibility was assessed using *in vitro* cytotoxicity assays. To evaluate immunomodulatory effects, lipopolysaccharide (LPS)-stimulated macrophages were treated with Treg-EVs. Macrophage phenotype and inflammatory cytokine expression were analysed by qPCR and ELISA, while metabolic alterations associated with macrophage activation were also examined.

Results

Treg-EVs were successfully isolated and displayed characteristic extracellular vesicle morphology and size distribution. *In vitro* assays confirmed excellent biocompatibility with target cells. Treatment with Treg-EVs significantly attenuated the pro-inflammatory macrophage phenotype, as demonstrated by reduced expression of M1-associated inflammatory markers and cytokines. Furthermore, Treg-EVs modulated macrophage metabolic activity, suggesting immunometabolic reprogramming as a potential mechanism underlying their anti-inflammatory effects.

Conclusions

Human Treg-EVs exhibit favourable biosafety and potent immunomodulatory activity by suppressing inflammatory macrophage responses and regulating macrophage metabolism. These findings support the potential of Treg-EVs as a novel cell-free immunotherapy for restoring immune homeostasis and promoting periodontal regeneration in periodontitis.

Probiotic Ecological Engineering of Periodontal Dysbiosis: Multi-Omic Evidence for 3D Polymicrobial Biofilm Reprogramming

Researcher/s: Nadeeka Udawatte

Supporting Researchers: Prof. J Seneviratne, S. Ivanovski, T Arumugam

Aims/Objectives

Periodontitis is a polymicrobial, dysbiosis-driven disease whose long-term management remains constrained by incomplete biofilm removal, increasing antimicrobial resistance (AMR), and limited ecological resolution of conventional clinical endpoints. This study investigated whether the oral probiotic could function as an ecological engineer of polymicrobial periodontal biofilms by modulating community composition, functional activity, virulence, and antimicrobial resistance profiles.

Methods

Healthy and Stage III periodontitis-derived salivary biofilms (n=6 each) were established on three-dimensional melt-electro written polycaprolactone (3D MEW mPCL) scaffolds. Probiotic Ssk12 was introduced into established biofilms and monitored across colonisation, persistence, and withdrawal phases. Colonisation dynamics were assessed using quantitative PCR and spatial confocal imaging. Integrated multi-omic analyses included 16S rRNA gene sequencing to characterise community composition, meta transcriptomics to evaluate active community function, Virulence Factor Database (VFDB) profiling to assess virulence-associated pathways, and Comprehensive Antibiotic Resistance Database (CARD) analysis to characterise resistome responses. Healthy and periodontitis-associated biofilms were compared to identify condition-dependent probiotic effects.

Results

Ssk12 achieved transient colonisation of established polymicrobial biofilms, with peak abundance during active exposure followed by progressive decline after withdrawal. Probiotic administration induced significant ecological restructuring and transcriptomic reprogramming, altering microbial diversity and metabolic activity. In healthy biofilms, Ssk12 promoted shifts in metabolic, ribosomal, and stress-response pathways. In periodontitis-derived biofilms, Ssk12 reduced biofilm biomass and metabolic activity, contracted virulence-associated functions, including adhesion and proteolytic pathways, and suppressed overall antimicrobial resistance gene expression during colonisation. Importantly, no evidence of novel resistance gene acquisition, resistome expansion, or increased association with mobile genetic elements was observed. Although partial rebound occurred following probiotic withdrawal, the ecological footprint remained measurable and largely reversible.

Conclusions

Probiotic Ssk12 does not merely suppress pathogens but transiently reprograms the ecology, transcriptome, virulome, and resistome of polymicrobial periodontal biofilms. These findings provide mechanistic proof-of-concept for probiotic ecological engineering as a microbiome-directed, AMR-conscious strategy for managing periodontal dysbiosis and advancing precision periodontal therapy.

Patient-specific 3D-printed PCL Scaffolds for alveolar ridge augmentation

Researcher/s: Vamsi Anegundi

Supporting Researchers: Carla Agustina Perrote, Jamil Alayan, Reuben Staples, Sašo Ivanovski

Aims/Objectives

To evaluate the clinical, radiographic, and histologic outcomes of alveolar ridge augmentation using patient-specific three-dimensional (3D)-printed polycaprolactone (PCL) scaffolds for staged implant site development.

Methods

Ten patients requiring staged alveolar bone regeneration underwent preoperative cone-beam computed tomography (CBCT) for virtual defect reconstruction and fabrication of patient-specific medical-grade PCL scaffolds using high-resolution 3D printing, followed by γ -irradiation sterilisation. The scaffolds were loaded with a composite graft comprising autogenous bone, deproteinized bovine bone mineral, and injectable platelet-rich fibrin and covered with a resorbable collagen membrane. Clinical healing was monitored throughout treatment. Radiographic volumetric assessment was performed by superimposing baseline and six-month CBCT datasets using stable anatomical landmarks and calculating volumetric changes from triplicate measurements. At re-entry, core biopsies were harvested and processed as undecalcified ground sections for histologic evaluation.

Results

Healing was uneventful in most cases, with one wound dehiscence and one transient sensory disturbance. All sites achieved sufficient bone volume for implant placement, and all implants obtained primary stability. The mean baseline defect volume was $464.29 \pm 222.0 \text{ mm}^3$, and the mean regenerated volume was $513.12 \pm 321.40 \text{ mm}^3$, corresponding to a mean fractional volumetric gain of $112.0 \pm 35.0\%$. Histologic analysis demonstrated new bone formation throughout the augmented region, with bone extending around and between scaffold struts. Intimate contact between regenerated bone and scaffold surfaces indicated favourable scaffold integration and tissue organisation.

Conclusions

Patient-specific 3D-printed PCL scaffolds achieved predictable ridge augmentation, substantial volumetric bone gain, and favourable histologic integration, supporting their use for reconstruction of complex alveolar ridge defects before implant placement.

Oral Health as a Component of Healthy Ageing: A Scoping Review of Australian health Policy frameworks

Researcher/s: Manori Dhanapriyanka

Supporting Researchers: Sanketha Francis, Lyndal Pritchard, Helena Silveira Schuch, Diep Hong Ha, Peivand Bastani, Loc Do

Background

Oral health is a key determinant of healthy ageing yet remains poorly integrated within broader health systems and receives limited policy attention. This scoping review explores how oral and general health integration is addressed across Australian health policy frameworks for older adults.

Methods

Following Joanna Briggs Institute (JBI) recommendations, an electronic search of PubMed, Embase, Scopus, and Google Advanced was conducted to identify peer-reviewed and grey literature. were guided by the Population, Concept, Context framework: older adults, oral & general health integration, and Australian health policy frameworks published within the last 10 years. Three independent reviewers conducted the screening in Covidence.

Results

Of 2,396 records screened, 10 oral health and 13 general health policy frameworks were included. General health policies incorporating oral health spanned diverse areas, including mental health, disability, rehabilitation, health promotion, and public health. However, 46% referenced oral health only in policy context, 31% incorporated it into strategies and 15% included measurable indicators. In contrast, 80% of oral health policies integrated oral and general health at the strategic level, though only 30% specified indicators. Deductive thematic analysis identified key domains: governance, health promotion, service delivery, and workforce development. Integration strategies included oral health partnerships, a common risk factor approach, holistic care models, and interprofessional training.

Conclusions

Oral health policies demonstrate stronger integration of oral and general health within strategic frameworks, whereas general health policies show limited and largely superficial integration. This imbalance highlights persistent system-level fragmentation, with oral health insufficiently embedded in health system planning and implementation for older adults.

Salivary extracellular vesicles host methylome and microbiome in periodontitis

Researcher/s: Dr Pingping Han

Aim/Objectives

To investigate the salivary host extracellular vesicles DNA methylome and microbiome profiles in diagnosing periodontitis.

Methods

We recruited 20 healthy, 16 gingivitis, and 26 periodontitis patients before we isolated and characterised salivary host and microbial EVs, along with analysing the microbiome and methylome landscapes of the MVs.

Results

Periodontitis showed increased CD63, CD45, CD29 and CD24 positive EVs subpopulations (AUC > 0.7), along with significantly higher bacterial outer membrane vesicles (AUC > 0.89) from *Treponema*, *Fretibacterium*, and *Treponemadenticola*, compared to both healthy and gingivitis, as well as non-periodontitis (combining healthy and gingivitis) groups. MeDIP-seq identified 1,196 differentially methylated regions across 3' UTRs, CDS, introns, and intergenic regions (AUC > 0.9), distinguishing periodontitis from other groups. These methylated genes were enriched in inflammation-related pathways, including AMP-activated protein kinase (AMPK) and Toll-Like Receptor 4 (TLR4) pathways.

Conclusions

Our study reveals insights into imbalanced host-microbiome interplay that differ between periodontitis and healthy individuals and provides a rationale for the application of salivary MVs as a nanoscaled non-invasive liquid biopsy in periodontitis pathogenesis, which will provide further implications for their utilisation in the diagnosis of other systemic diseases.

Combating Misinformation in the Digital Age: A Machine Learning Approach to Protect Community Water Fluoridation and Promote Oral Health Equity

Researcher/s: Nilesh Torwane

Aim/Objectives

Community water fluoridation (CWF) is among the most effective interventions for preventing dental caries, yet online misinformation increasingly threatens public acceptance and exacerbates oral health inequities. This study developed, evaluated, and deployed machine learning (ML) and deep learning (DL) models to detect CWF-related misinformation on Twitter (now X) and assessed their alignment with sociodemographic and oral health disparities.

Methods

A total of 19,960 English-language CWF-related tweets were retrieved via the Twitter API. A subset of 2,000 tweets was manually annotated by two researchers (Cohen's $\kappa=0.87$) against CDC, WHO and ADA criteria, and used to train six ML/DL models: Logistic Regression, Decision Tree, Support Vector Classifier (SVC), BiLSTM+Attention, fine-tuned BERT, and a hybrid BERT+XGBoost classifier. US-geotagged tweets ($n=3,147$) were linked at the ZIP code level to American Community Survey, BRFSS, and NHANES indicators. VADER sentiment, thematic content analysis, and disparity ratios comparing high- vs low-misinformation regions were computed.

Results

The SVC achieved the highest accuracy (91.6%); the BERT+XGBoost model (89.9%) was deployed for its interpretability via SHAP and scalability. Of all tweets, 78.8% were classified as misinformation, with the most common themes being safety concerns (68%), distrust of government (42%), and "natural/chemical-free" narratives (35%). Misinformation tweets were shorter and more negatively toned yet attracted nearly twice as much engagement (39 vs 21 likes; 14 vs 6 retweets). High-misinformation regions had lower median income (\$52,180 vs \$58,420), higher poverty rates (18.7% vs 12.3%), fewer dentists per 100,000, and higher rates of untreated caries in children (25.3% vs 14.8%) and adults (32.6% vs 22.1%).

Conclusions

Interpretable AI surveillance tools can detect CWF misinformation at scale and reveal its concentration in socioeconomically disadvantaged communities. Integrated with equity-focused communication strategies, such tools can protect CWF and help reduce misinformation-driven oral health inequities.

Bridging Evidence to Practice: A Co-Designed Implementation Blueprint for Oral Health Assessment in Australian Residential Aged Care

Researcher/s: Lyndal Pritchard

Supporting Researchers: Matthew Hopcraft, Helena Schuch, Loc Do, Nicole Stormon

Background

Oral health care remains poorly implemented in residential aged care (RAC) despite robust evidence of need. Oral health assessment tools (OHAT) are validated instruments supporting non-dental staff to assess the mouth and trigger referral. However, OHAT's are frequently introduced through isolated initiatives with limited uptake and poor sustainment.

Aims/Objectives

To develop a structured, theory-informed implementation blueprint for embedding oral health assessment tools into RAC in Australia.

Methods

A qualitative co-design study was conducted. Forty-one multidisciplinary stakeholders participated in a full-day workshop. Workshop activities were structured around four thematic domains derived from a preceding national e-Delphi consensus study. Participants used the Expert Recommendations for Implementing Change (ERIC) taxonomy to identify and specify implementation strategies, which were then mapped to the Exploration, Preparation, Implementation, Sustainment (EPIS) framework and consolidated through analytic synthesis.

Results

Forty-two ERIC-aligned implementation strategies were identified across four thematic domains. Strategies were distributed across EPIS phases (Exploration n=7; Preparation n=10; Implementation n=10; Sustainment n=10), with five cross-phase bridging strategies. Analytic synthesis consolidated strategies into seven functional implementation domains forming an EPIS-ERIC informed implementation blueprint.

Conclusions

The implementation blueprint provides a phase-specific, operationalised response to the persistent evidence-to-practice gap in RAC oral health care. Sustainable integration requires coordinated alignment across system-level funding and policy, organisational readiness, and routine care workflows. Findings have implications for aged care policy reform, workforce planning, and future implementation research design.

Income- and education-related inequalities in dental visits by remoteness

Researcher/s: Man Bui

Supporting Researchers: Loc Do, Diep Ha

Aims/Objectives

Limited research on socioeconomic inequalities for dental visits among children. This study aims to investigate the income- and maternal education-related inequalities in dental visits among Queensland children in different geographic areas.

Methods

A population-based cross-sectional study of 5,402 Queensland children aged 5 to 14 from 2010 to 2012, using parental questionnaires and oral examinations. The proportion of children's age at the first dental visit, the dental visit pattern, the reason for the first and the last dental visits, and the type of dental services used in the last visit were estimated as a primary outcome, considering the sampling was weighted for population by remoteness status using household income and maternal educational levels as disparity variables. Socioeconomic inequalities in dental visits were calculated by HEAT Plus, including Slope Index of Inequality (SII) and Relative Index of Inequality (RII).

Results

5,402 children aged 5- to 14-year-olds were observed in different geographical areas. All negative values of SII and RII indicated that irregular dental visit pattern was concentrated among lower-income and less educated groups. Socioeconomic inequalities in dental visit patterns, reasons for dental visit at the first and the last time among Queensland children in major cities were the greatest, followed by outer regional areas and inner regional areas. Socioeconomic inequalities in using public clinics and hospitals during the last visit were concentrated on the lower-income and lower-education groups. The most widespread inequalities for dental services utilisation were in major cities for both the public and private sectors.

Conclusions

These findings indicate evidence of socioeconomic inequalities in dental visits among children 5-14-year-olds in Queensland. Those inequalities were higher in major cities compared to inner and outer regional/remote areas.

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