

---

# Sir John Walsh Research Institute

## Research report 2021-2022

### Table of contents

About the SJWRI	2
Research publications	3
Research funding	34
Postgraduate completions	43
Thesis research abstracts	47

# The Sir John Walsh Research Institute advances research and increases knowledge for the improvement of oral health in New Zealand.

As the research arm of the [University of Otago's Faculty of Dentistry](#), ranked as one of the best dental schools in the world, the SJWRI provides a integral focus for dental research within New Zealand and internationally.

Our innovative, future-focused, interconnected research programmes cover the spectrum of oral health research, from the molecular, through biological systems to the health of populations.

Our members have well-established productive collaborations across the University and with other institutions in New Zealand and worldwide.

Our mission is to undertake research that underpins our teaching and clinical practice, and that translates discoveries into measurable health improvements for all New Zealanders.

The Institute is named after Sir John Walsh, Dean of the Otago Faculty of Dentistry from 1946 to 1971, who was a strong advocate for research in dentistry and oral health.

## Our research programmes

### Biomaterials, biomechanics and oral implantology

Understanding the oral environment

### Clinical and translational research

Fostering research to improve patient care

### Craniofacial research

Investigating dento-facial growth and jaw function

### Dental education research

Understanding how students learn and fostering best practices in teaching

### Dental epidemiology and public health

Population and dental health services research

### Dental engineering and tissue regeneration

Finding new ways to repair and regrow tissue in the oral environment

### Molecular microbiology

Preventing oral diseases caused by microorganisms

### Oral molecular and immunopathology

Understanding diseases in order to improve diagnosis and treatment

## Our people

[Research expertise and interests of our academic and research staff \(A-Z index\)](#)

## Our highlights

[News and events from the SJWRI](#)

Faculty of Dentistry  
Te Kāupēka Pūmāhō

THIS STONE WAS Laid BY  
THE RIGHT HONOURABLE  
E. J. McLEOD  
PRIME MINISTER  
ON THE SIXTH DAY OF  
MAY 1957

THIS STONE WAS Laid BY  
THE RIGHT HONOURABLE  
E. J. McLEOD  
PRIME MINISTER  
ON THE SIXTH DAY OF  
MAY 1957

## Research publications and outputs summary, 2021-2022

Publication/output category	2021		2022		Total 2021-2022	
	PCs	UPCs	PCs	UPCs	PCs	UPCs
Chapter in Book - Research	4	3.33	14	14.00	18	17.33
Chapter in Book - Other	0	0.00	1	1.00	1	1.00
Journal - Research Article	134	118.05	155	134.09	289	252.13
Journal - Research Other	41	36.77	33	29.84	74	66.61
Journal - Professional & Other Non-Research Articles	8	8.00	12	12.00	20	20.00
Conference Contribution - Published proceedings: Abstract	11	9.02	43	36.51	54	45.53
Conference Contribution - Edited volume of conference proceedings	0	0.00	3	0.30	3	0.30
Conference Contribution - Poster Presentation (not in published proceedings)	0	0.00	3	1.60	3	1.60
Conference Contribution - Verbal presentation and other Conference outputs	29	27.23	12	8.73	41	35.97
Other Research Output	1	1.00	2	1.33	3	2.33
Awarded Doctoral Degree	18	18.00	11	11.00	29	29.00
Awarded Masters Degree	0	0.00	1	1.00	1	1.00
<b>Total - Sir John Walsh Research Institute</b>	<b>246</b>	<b>221.40</b>	<b>290</b>	<b>251.41</b>	<b>536</b>	<b>472.81</b>

**PC** Publication counts

**UPC** Unique publication counts

*To avoid double counting, unique publication counts are used when a publication has authorship from more than one department; e.g. for a publication with authors from more than one department, each department's contribution is allocated proportionally.*

*All data courtesy the PBRF and Publications Office, Research Division, University of Otago, with thanks to Molly McCormick, Research Outputs Administrator.*



## Full listing of SJWRI research publications, 2021-2022

*Listing includes all publications including authors with SJWRI or Faculty of Dentistry affiliations, listed by year (2022 first).*

*All data courtesy the PBRF and Publications Office, Research Division, University of Otago, with thanks to Molly McCormick, Research Outputs administrator.*

### Chapter in Book - Research

Abduo, J., Lyons, K., Shah, K. C., Wu, B. M., Faulkner, R. F., & Al-Amleh, B. (2022). Digital technologies and implant dentistry. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 86-109). Batavia, IL: Quintessence Publishing.

Ali, M. A., & Gould, M. L. (2022). Innovativeness and sustainability of polymer nanocomposites. In M. E. Hoque, K. Ramar & A. Sharif (Eds.), *Advance polymer nanocomposites: Science, technology and applications*. (pp. 515-535). Cambridge, MA: Woodhead Publishing. <https://doi.org/10.1016/B978-0-12-824492-0.00001-5>

Barakat, N. J., Sabri, R., AbouJaoude, N., Firth, F., Farella, M., & Faulkner, R. F. (2022). Implants and orthodontics: A symbiotic partnership. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 516-537). Batavia, IL: Quintessence Publishing.

Beumer, III, J., Faulkner, R. F., Lyons, K. M., Jayanetti, J., Orellana, D., & Davodi, A. (2022). Restoration of edentulous maxillae with implant-retained overdentures. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 202-243). Batavia, IL: Quintessence Publishing.

Beumer, III, J., Faulkner, R. F., Lyons, K. M., Ma, S., Hanlin, S. M., & Orellana, D. (2022). Restoration of edentulous mandibles with overdentures. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 123-158). Batavia, IL: Quintessence Publishing.

Beumer, III, J., Lyons, K. M., Kahenasa, N., Tong, D. C., & Sung, E. (2022). Implants in irradiated tissues, osteoporosis patients, and patients treated with bisphosphonates. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 498-515). Batavia, IL: Quintessence Publishing.

Duncan, H. F., & Cooper, P. R. (2022). The bioactive properties of dentine and molecular advances in pulp regeneration. In H. M. A. Ahmed & P. M. H. Dummer (Eds.), *Endodontic advances and evidence-based clinical guidelines*. (pp. 51-73). Hoboken, NJ: Wiley Blackwell.

Faulkner, R. F., Krill, D., Beumer, III, J., Atieh, M., & Tawse-Smith, A. (2022). Follow-up, maintenance, complications, and troubleshooting. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 562-599). Batavia, IL: Quintessence Publishing.

Garrett, N., Nishimura, I., Ma, S., & Lyons, K. M. (2022). Edentulous patients: Patterns of bone resorption and clinical outcomes with implants. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 112-122). Batavia, IL: Quintessence Publishing.

Nishimura, I., Ogawa, T., Al-Amleh, B., Atieh, M., Tawse-Smith, A., & Wu, B. M. (2022). Osseointegration, its maintenance, and recent advances in implant surface bioreactivity. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 16-36). Batavia, IL: Quintessence Publishing.

Olson, H. (2022). Reflection towards excellence: Empowering learners to become reflective practitioners. In K. Enomoto, R. Warner & C. Nygaard (Eds.), *Active learning in higher education: Student engagement and deeper learning outcomes*. (pp. 63-82). Oxfordshire, UK: Libri Publishing.

Prasad, S., Farella, M., & Melsen, B. (2022). Treatment duration: Can it be shortened? In B. Melsen & C. Luzi (Eds.), *Adult orthodontics*. (2nd ed.) (pp. 438-445). Hoboken, NJ: John Wiley & Sons. <https://doi.org/10.1002/9781119775805.ch20>

Waddell, N., Li, K. C., Barazanchi, A., Shah, K. C., Al-Amleh, B., Lyons, K. M., & Wu, B. M. (2022). Contemporary implant materials. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry (Vol. 1): Prosthodontic principles*. (2nd ed.) (pp. 60-85). Batavia, IL: Quintessence Publishing.

Wu, B. M., Abduo, J., Lyons, K. M., Schwass, D. R., Shah, K. C., Serichetaphongse, P., & Faulkner, R. F. (2022). Implant biomechanics, screw mechanics, and occlusal concepts for implant patients. In J. Beumer, III, R. F. Faulkner, K. C. Shah & B. M. Wu (Eds.), *Fundamentals of implant dentistry* (Vol. 1): Prosthodontic principles. (2nd ed.) (pp. 37-59). Batavia, IL: Quintessence Publishing.

Bogen, G., Dammaschke, T., & Chandler, N. (2021). Vital pulp therapy. In L. H. Berman & K. M. Hargreaves (Eds.), *Cohen's pathways of the pulp*. (12th ed.) (pp. 902-938). St Louis, MO: Elsevier.

Chong, B. S., & Chandler, N. (2021). Root canal filling materials and techniques. In J. Camilleri (Ed.), *Endontic materials in clinical practice*. (pp. 181-218). Hoboken, NJ: Wiley Blackwell. <https://doi.org/10.1002/9781119513568.ch6>

Olson, H. (2021). Collaborative enquiry-based learning in an oral health program. In K. Enomoto, R. Warner & C. Nygaard (Eds.), *Teaching and learning innovations in higher education*. (pp. 405-424). Oxfordshire, UK: Libri Publishing.

Ramesh, N., Ratnayake, J. T. B., & Dias, G. J. (2021). Calcium-based ceramic biomaterials. In C. Wen (Ed.), *Structural biomaterials: Properties, characteristics, and selection*. (pp. 333-394). Duxford, UK: Woodhead Publishing. <https://doi.org/10.1016/B978-0-12-818831-6.00011-2>

## Chapter in Book - Other

Loch, C. (2022). From South America to Aotearoa: My PhD journey. In D. B. Thomas & D. E. Lee (Eds.), *R. Ewan Fordyce: Tributes from a global community*. (pp. 60-61). Wellington, New Zealand: Geoscience Society of New Zealand.

## Journal - Research Article

Abdelmoneim, D., Porter, G. C., Coates, D. E., Duncan, W. J., Waddell, J. N., Hammer, N., & Li, K. C. (2022). The effect of low-processing temperature on the physicochemical and mechanical properties of bovine hydroxyapatite bone substitutes. *Materials*, 15, 2798. <https://doi.org/10.3390/ma15082798>

Ahmed, H., Ratnayake, J., Cathro, P., & Chandler, N. (2022). The effect of an additional application of sealer prior to backfilling in the Continuous Wave of Condensation technique. *Australian Endodontic Journal*. Advance online publication. <https://doi.org/10.1111/aej.12658>

Al Naasan, Z., Broadbent, J. M., Duncan, W. J., & Smith, M. B. (2022). Perceptions of tailored oral health education resources among former refugees. *New Zealand Dental Journal*, 118(3), 104-109.

Al Naasan, Z., Broadbent, J., Smith, M., & Duncan, W. (2022). Evaluation of a tailored oral health promotion intervention for Syrian former refugees in New Zealand. *Health Promotion International*, 37(4). <https://doi.org/10.1093/heapro/daac132>

Al-Maswary, A. A., O'Reilly, M., Holmes, A. P., Walmsley, A. D., Cooper, P. R., & Scheven, B. A. (2022). Exploring the neurogenic differentiation of human dental pulp stem cells. *PLoS ONE*, 17(11), e0277134. <https://doi.org/10.1371/journal.pone.0277134>

AlAli, F., Atieh, M. A., Hannawi, H., Jamal, M., Al Harbi, N., Alsabeeha, N. H. M., & Shah, M. (2022). Anterior maxillary labial bone thickness on cone beam computed tomography. *International Dental Journal*. Advance online publication. <https://doi.org/10.1016/j.identj.2022.03.007>

Alhumaidi, M., Nentwig, L.-M., Rahman, H., Schmitt, L., Rudrow, A., Harris, A., ... Lamping, E., ... Golin, J. (2022). Residues forming the gating regions of asymmetric multidrug transporter Pdr5 also play roles in conformational switching and protein folding. *Journal of Biological Chemistry*, 298(12), 102689. <https://doi.org/10.1016/j.jbc.2022.102689>

AlSamahi, S., Milne, T. M., Hussaini, H., Rich, A. M., & Friedlander, L. T. (2022). Type 2 diabetes and the clinically normal pulp: An in-vitro study. *International Endodontic Journal*. Advance online publication. <https://doi.org/10.1111/iej.13732>

Aral, K., Milward, M. R., & Cooper, P. R. (2022). Inflammasome dysregulation in human gingival fibroblasts in response to periodontal pathogens. *Oral Diseases*, 28, 216-224. <https://doi.org/10.1111/odi.13760>

Arora, S., Cooper, P. R., Friedlander, L. T., Seo, B., Rizwan, S. B., Rich, A. M., & Hussaini, H. M. (2022). Potentiality and inflammatory marker expression are maintained in dental pulp cell cultures from carious teeth. *International Journal of Molecular Sciences*, 23(16), 9425. <https://doi.org/10.3390/ijms23169425>

Atieh, M. A., Almutairi, A., Amir-Rad, F., Koleilat, M., Tawse-Smith, A., Ma, S., ... Alsabeeha, N. H. M. (2022). A retrospective analysis of biological complications of dental implants. *International Journal of Dentistry*, 2022, 1545748. <https://doi.org/10.1155/2022/1545748>

Atieh, M. A., Alnaqbi, M., Abdunabi, F., Lin, L., & Alsabeeha, N. H. M. (2022). Alveolar ridge preservation in extraction sockets of periodontally compromised teeth: A systematic review and meta-analysis. *Clinical Oral Implants Research*. Advance online publication. <https://doi.org/10.1111/clr.13975>

- Atieh, M. A., Fadhul, I., Shah, M., Hannawi, H., & Alsabeeha, N. H. M. (2022). Diode laser as an adjunctive treatment for peri-implant mucositis: A systematic review and meta-analysis. *International Dental Journal*. Advance online publication. <https://doi.org/10.1016/j.identj.2022.06.026>
- Atieh, M. A., Guirguis, M., Alsabeeha, N. H. M., & Cannon, R. D. (2022). The diagnostic accuracy of saliva testing for SARS-CoV-2: A systematic review and meta-analysis. *Oral Diseases*, 28(Suppl. 2), 2347-2361. <https://doi.org/10.1111/odi.13934>
- Aziz, M. A., Seo, B., Hussaini, H. M., Hibma, M., & Rich, A. M. (2022). Comparing two methods for the isolation of exosomes. *Journal of Nucleic Acids*, 8648373. <https://doi.org/10.1155/2022/8648373>
- Badarneh, A., Choi, J. J. E., Lyons, K., Porter, G., Waddell, N., & Li, K. C. (2022). The effect of aging on the wear performance of monolithic zirconia. *Dental Materials*. Advance online publication. <https://doi.org/10.1016/j.dental.2022.04.018>
- Bai, Y., Liu, X., Li, J., Wang, Z., Guo, Q., Xiao, M., Cooper, P. R., ... He, W. (2022). Stage-dependent regulation of dental pulp stem cell odontogenic differentiation by transforming growth factor- $\beta$ 1. *Stem Cells International*, 2022, 2361376. <https://doi.org/10.1155/2022/2361376>
- Baker, M. G., Gurney, J., Moreland, N. J., Bennett, J., Oliver, J., Williamson, D. A., Pierse, N., ... Merriman, T. R., ... Edwards, R., ... Thomson, W. M., Zhang, J., & Lennon, D. (2022). Risk factors for acute rheumatic fever: A case-control study. *Lancet Regional Health: Western Pacific*. Advance online publication. <https://doi.org/10.1016/j.lanwpc.2022.100508>
- Bates, A. J., King, C., Dhar, M., Fitzpatrick, C., & Laven, R. A. (2022). Retention of internal teat sealants over the dry period and their efficacy in reducing clinical and subclinical mastitis at calving. *Journal of Dairy Science*. Advance online publication. <https://doi.org/10.3168/jds.2021-21585>
- Beckett, D. M., Broadbent, J. M., Loch, C., Mahoney, E. K., Drummond, B. K., & Wheeler, B. J. (2022). Dental consequences of vitamin D deficiency during pregnancy and early infancy: An observational study. *International Journal of Environmental Research & Public Health*, 19, 1932. <https://doi.org/10.3390/ijerph19041932>
- Beckett, D. M., Wheeler, B. J., Loch, C., Mahoney, E. K., Drummond, B. K., & Broadbent, J. M. (2022). Dental health in a cohort of six-year-old New Zealand children who were breastfed as infants: A comprehensive descriptive study. *New Zealand Dental Journal*, 118(1), 5-13.
- Benn, A. M. L., Heng, N. C. K., Thomson, W. M., & Broadbent, J. M. (2022). Plaque and dental caries risk in mid-life. *Caries Research*, 56, 464-476. <https://doi.org/10.1159/000527255>
- Benn, A. M. L., Heng, N. C. K., Thomson, W. M., Sissons, C. H., Gellen, L. S., Gray, A. R., & Broadbent, J. M. (2022). Associations of sex, oral hygiene and smoking with oral species in distinct habitats at age 32 years. *European Journal of Oral Sciences*, 130, e12829. <https://doi.org/10.1111/eos.12829>
- Bennani, H., McCane, B., & Cornwall, J. (2022). Three-dimensional reconstruction of in vivo human lumbar spine from biplanar radiographs. *Computerized Medical Imaging & Graphics*, 96, 102011. <https://doi.org/10.1016/j.compmedimag.2021.102011>
- Bhowmik, S., Agyei, D., & Ali, A. (2022). Bioactive chitosan and essential oils in sustainable active food packaging: Recent trends, mechanisms, and applications. *Food Packaging & Shelf Life*, 34, 100962. <https://doi.org/10.1016/j.fpsl.2022.100962>
- Bhowmik, S., Zakaria, M. A., Sarwar, M. S., Shofi, S. B., Syduzzaman, Akter, F., ... Mamun, A.-A. (2022). Development and nutritional index of ready to use fish products (RUFs) from small fish species: Future superfoods for consumers. *Applied Food Research*. Advance online publication. <https://doi.org/10.1016/j.afres.2022.100111>
- Bidinotto, A. B., Martinez-Steele, E., Thomson, W. M., Hugo, F. N., & Hilgert, J. B. (2022). Investigation of direct and indirect association of ultra-processed foods intake and periodontitis. *Journal of Periodontology*, 93, 603-612. <https://doi.org/10.1002/jper.21-0274>
- Bohnert, S., Trella, S., Preiß, U., Heinsen, H., Bohnert, M., Zwirner, J., ... Ondruschka, B. (2022). Density of TMEM119-positive microglial cells in postmortem cerebrospinal fluid as a surrogate marker for assessing complex neuropathological processes in the CNS. *International Journal of Legal Medicine*. Advance online publication. <https://doi.org/10.1007/s00414-022-02863-5>
- Boyd, D. H., Moffat, S. M., Foster Page, L. A., Lacey, J. K., Fuge, K. N., Natarajan, A. K., Misa, T. F., & Thomson, W. M. (2022). Oral health of children in Aotearoa New Zealand: Time for change. *Journal of the Royal Society of New Zealand*. Advance online publication. <https://doi.org/10.1080/03036758.2022.2069826>
- Brunton, P. A., McLean, M., Vedagiri, S., McKeage, J., Ruddy, B., Weatherly, K., ... Loch, C. (2022). Jet injection needle-free dental anaesthesia: Initial findings. *Journal of Dentistry*, 122, 104165. <https://doi.org/10.1016/j.ident.2022.104165>

- Bussey, M. D., Davidson, P., Salmon, D., Romanchuk, J., Tong, D., & Sole, G. (2022). Influence of the frame of reference on head acceleration events recorded by instrumented mouthguards in community rugby players. *BMJ Open Sport & Exercise Medicine*, 8(4), e001365. <https://doi.org/10.1136/bmjsem-2022-001365>
- Cai, M., Ratnayake, J., Cathro, P., Gould, M., & Ali, A. (2022). Investigation of a novel injectable chitosan oligosaccharide-bovine hydroxyapatite hybrid dental biocomposite for the purposes of conservative pulp therapy. *Nanomaterials*, 12, 3925. <https://doi.org/10.3390/nano12213925>
- Carruthers, K. A., Adam, L. A., & Moffat, S. M. (2022). Dental and oral health therapists' perceptions of continuity of patient care. *New Zealand Dental Journal*, 118(3), 97-103.
- Chandravarnan, P., Agyei, D., & Ali, A. (2022). Green and sustainable technologies for the decontamination of fungi and mycotoxins in rice: A review. *Trends in Food Science & Technology*, 124, 278-295. <https://doi.org/10.1016/j.tifs.2022.04.020>
- Chen, X., Zhao, X., Jones, M. B., Harper, A., de Seymour, J. V., Yang, Y., ... Cannon, R. D., ... Baker, P. N. (2022). The relationship between hair metabolites, air pollution exposure and gestational diabetes mellitus: A longitudinal study from pre-conception to third trimester. *Frontiers in Endocrinology*, 13, 1060309. <https://doi.org/10.3389/fendo.2022.1060309>
- Choi, J. J. E., Chen, J., Choi, Y. J., Moffat, S. M., Duncan, W. J., Waddell, J. N., & Jermy, M. (2022). Dental high-speed handpiece and ultrasonic scaler aerosol generation levels and the effect of suction and air supply. *Infection Control & Hospital Epidemiology*. Advance online publication. <https://doi.org/10.1017/ice.2022.196>
- da Silva, N. P., da Silva, J. C. C., Freitas, A., Rebello, I. M. C., Yang, R., Wang, T., Zhao, R., & Nogueira, G. (2022). Cone-beam computed tomographic evaluation of dimensional hard tissue changes following alveolar ridge preservation with leucocyte and platelet-rich fibrin techniques: A pilot study. *Brazilian Dental Science*, 25(3), e3535. <https://doi.org/10.4322/bds.2022.e3535>
- Dai, L. L., Mei, M. L., Chu, C. H., & Lo, E. C. M. (2022). Effect of strontium-doped bioactive glass-ceramic containing toothpaste on prevention of artificial dentine caries formation: An in vitro study. *BMC Oral Health*, 22, 288. <https://doi.org/10.1186/s12903-022-02321-z>
- Darlow, B., Brown, M., McKinlay, E., Gray, L., Purdie, G., Pullon, S., the Longitudinal Interprofessional Study Group, including Beckingsale, L., Foster Page, L., Gallagher, P., Handley, J., Herkt, J., Kuperus, L., McHugh, P., Meldrum, A., Skinner, M., Schwass, R., Weaver, J., Wilson, C., & Windle, J. (2022). Longitudinal impact of preregistration interprofessional education on the attitudes and skills of health professionals during their early careers: A non-randomised trial with 4-year outcomes. *BMJ Open*, 12, e060066. <https://doi.org/10.1136/bmjopen-2021-060066>
- Deng, X., Gould, M., & Ali, M. A. (2022). A review of current advancements for wound healing: Biomaterial applications and medical devices. *Journal of Biomedical Materials Research Part B*, 110, 2542-2573. <https://doi.org/10.1002/jbm.b.35086>
- Duncan, W. J., & Coates, D. E. (2022). Meeting the challenges and clinical requirements for dental regeneration: The New Zealand experience. *Bone*, 154, 116181. <https://doi.org/10.1016/j.bone.2021.116181>
- Duncan, W. J., Ma, S., Siddiqi, A., & Osman, R. B. (2022). Zirconia versus titanium implants: 8-year follow-up in a patient cohort contrasted with histological evidence from a preclinical animal model. *Materials*, 15(15), 5322. <https://doi.org/10.3390/ma15155322>
- Edirisinghe, S. T., Weerasekera, M., De Silva, D. K., Liyanage, I., Niluka, M., Madushika, K., ... Rich, A. M., De Silva, H., Hussaini, H. M., ... Yasawardene, S. (2022). The risk of oral cancer among different categories of tobacco smoking exposure in Sri Lanka. *Asian Pacific Journal of Cancer Prevention*, 23, 2929-2935. <https://doi.org/10.31557/apjcp.2022.23.9.2929>
- Edwards, W., Hond, R., Ratima, M., Tamati, A., Treharne, G. J., Hond-Flavell, E., Theodore, R., Carrington, S. D., & Poulton, R. (2022). Tawhiti nui, tawhiti roa: tawhiti tūāuriuri, tawhiti tūāhekeheke: A Māori lifecourse framework and its application to longitudinal research. *Journal of the Royal Society of New Zealand*. Advance online publication. <https://doi.org/10.1080/03036758.2022.2113411>
- Firmanda, A., Fahma, F., Syamsu, K., Cabral, J., Pletzer, D., & Gustiananda, M. (2022). Cellulose composites containing active constituents of coffee and tea: A prospective novel wound dressing. *Materials Advances*, 3, 7463-7483. <https://doi.org/10.1039/D2MA00642A>



- Gil, F., Laiolo, J., Bayona-Pacheco, B., Cannon, R. D., Ferreira-Pereira, A., & Carpinella, M. C. (2022). Extracts from Argentinian native plants reverse fluconazole resistance in *Candida* species by inhibiting the efflux transporters Mdr1 and Cdr1. *BMC Complementary Medicine & Therapies*, 22(1), 264. <https://doi.org/10.1186/s12906-022-03745-4>
- Goh, R., Tawse-Smith, A., Atieh, M., Duncan, W., Ma, S., & Li, K. C. (2022). The effect of implantoplasty on dental implant fracture resistance: A systematic review. *IIUM Journal of Orofacial & Health Sciences*, 3(1), 124-135. <https://doi.org/10.31436/ijohs.v3i1.113>
- Greer, P. F. C., Rich, A., & Coates, D. E. (2022). Effects of galectin-1 inhibitor OTX008 on oral squamous cell carcinoma cells in vitro and the role of AP-1 and the MAPK/ERK pathway. *Archives of Oral Biology*, 132, 105335. <https://doi.org/10.1016/j.archoralbio.2021.105335>
- Grymak, A., Waddell, J. N., Aarts, J. M., Ma, S., & Choi, J. J. E. (2022). Evaluation of wear behaviour of various occlusal splint materials and manufacturing processes. *Journal of the Mechanical Behavior of Biomedical Materials*, 126, 105053. <https://doi.org/10.1016/j.jmbbm.2021.105053>
- Guiney, H., Caspi, A., Ambler, A., Belsky, J., Kokaua, J., Broadbent, J., Cheyne, K., Dickson, N., Hancox, R. J., Harrington, H., Hogan, S., Ramrakha, S., Righthart, A., Thomson, W. M., ... Poulton, R. (2022). Childhood sexual abuse and pervasive problems across multiple life domains: Findings from a five-decade study. *Development & Psychopathology*. Advance online publication. <https://doi.org/10.1017/S0954579422001146>
- Ha, D. H., Nguyen, H., Dao, A., Golley, R. K., Thomson, W. M., Manton, D. J., ... Do, L. G. (2022). Group-based trajectories of maternal intake of sugar-sweetened beverage and offspring oral health from a prospective birth cohort study. *Journal of Dentistry*, 104113. Advance online publication. <https://doi.org/10.1016/j.jdent.2022.104113>
- Haag, D. G., Schuch, H. S., Nath, S., Baker, S. R., Celeste, R. K., Thomson, W. M., & Jamieson, L. M. (2022). Gender inequities in dental research publications: Findings from 20 years. *Community Dentistry & Oral Epidemiology*. Advance online publication. <https://doi.org/10.1111/cdoe.12831>
- Han, C., Mei, L., Liu, A., Ya Mohammad Hassan, S., Polonowita, A., & Guan, G. (2022). Oral medicine services: A two-centre study of 99,603 patients between 2015 and 2020. *Journal of International Medical Research*, 50(8). <https://doi.org/10.1177/03000605221115384>
- Han, L., Mei, L., Zhang, C., Wu, T., Wang, C., & Li, H. (2022). Correction of Class II division 2 with crowding and bilateral fully transposed impacted mandibular canines. *Australasian Orthodontic Journal*, 38(1), 29-40. <https://doi.org/10.21307/aoj-2022.004>
- Hewitt, B., Batt, J., Shelton, R. M., Cooper, P. R., Landini, G., Lucas, R. A., ... Milward, M. R. (2022). A 3D printed device for in vitro generation of stratified epithelia at the air-liquid interface. *Tissue Engineering Part C: Methods*, 28(11), 599-609. <https://doi.org/10.1089/ten.TEC.2022.0130>
- Hodgkinson, D., Prasad, S., Antoun, J. S., Mei, L., & Farella, M. (2022). Biomechanical properties of the lips in a pre-orthodontic sample of adolescents and young adults. *European Journal of Orthodontics*, 44(2), 232-239. <https://doi.org/10.1093/ejo/cjab053>
- Hong, C. Y., Boyd, M., Wilson, G., & Hong, S. C. (2022). Photorefractive screening plus atropine treatment for myopia is cost-effective: A proof-of-concept Markov analysis. *Clinical Ophthalmology*, 16, 1941-1952. <https://doi.org/10.2147/OPTH.S362342>
- Islam, M. T., Laing, R. M., Wilson, C. A., McConnell, M., & Ali, M. A. (2022). Fabrication and characterization of 3-dimensional electrospun poly(vinyl alcohol)/keratin/chitosan nanofibrous scaffold. *Carbohydrate Polymers*, 275, 118682. <https://doi.org/10.1016/j.carbpol.2021.118682>
- Islam, T., Saha, D., Bhowmik, S., Nordin, N., Islam, S., Nur, A.-A. U., & Begum, M. (2022). Nutritional properties of wild and fattening mud crab (*Scylla serrata*) in the south-eastern district of Bangladesh. *Heliyon*, 8, e09696. <https://doi.org/10.1016/j.heliyon.2022.e09696>
- James, J. E., Santhanam, J., Cannon, R. D., & Lamping, E. (2022). Voriconazole treatment induces a conserved sterol/pleiotropic drug resistance regulatory network, including an alternative ergosterol biosynthesis pathway, in the clinically important FSSC species, *Fusarium keratoplasticum*. *Journal of Fungi*, 8(10), 1070. <https://doi.org/10.3390/jof8101070>
- James, J. E., Santhanam, J., Zakaria, L., Mamat Rusli, N., Abu Bakar, M., Suetrong, S., ... Lamping, E., & Cannon, R. D. (2022). Morphology, phenotype, and molecular identification of clinical and environmental *Fusarium solani* species complex isolates from Malaysia. *Journal of Fungi*, 8(8), 845. <https://doi.org/10.3390/jof8080845>
- Kallarakkal, T. G., Siriwardena, B. S. M. S., Samaranyaka, A., De Silva, R., & Tilakaratne, W. M. (2022). A validated predictive model for risk of nodal metastasis in node negative oral squamous cell carcinoma of the buccal mucosa and tongue. *Journal of Oral Pathology & Medicine*, 51, 436-443. <https://doi.org/10.1111/jop.13294>



- Kang, A., Firth, F. A., Antoun, J., Mei, L., Ali, A., & Farella, M. (2022). Three-dimensional digital assessment of typodont activations. *Orthodontics & Craniofacial Research*. Advance online publication. <https://doi.org/10.1111/ocr.12611>
- Ke, L., Nogueira, G., & Thomson, W. M. (2022). Influence of case definitions on epidemiological estimates of periodontitis prevalence and its associations with smoking and OHRQoL. *Community Dentistry & Oral Epidemiology*. Advance online publication. <https://doi.org/10.1111/cdoe.12726>
- Khurshid, Z., Alfarhan, M. F., Mazher, J., Bayan, Y., Cooper, P. R., Dias, G. J., ... Ratnayake, J. (2022). Extraction of hydroxyapatite from camel bone for bone tissue engineering application. *Molecules*, 27(22), 7946. <https://doi.org/10.3390/molecules27227946>
- Khurshid, Z., Asiri, F. Y. I., Najeeb, S., & Ratnayake, J. (2022). The impact of autologous platelet concentrates on the periapical tissues and root development of replanted teeth: A systematic review. *Materials*, 15, 2776. <https://doi.org/10.3390/ma15082776>
- Kumar Yadalam, P., Madapusi Balaji, T., Varadarajan, S., Alzahrani, K. J., Al-Ghamdi, M. S., Ali Baeshen, H., ... Ratnayake, J., & Patil, S. (2022). Assessing the therapeutic potential of angomelatine, ramelteon, and melatonin against SARS-Cov-2. *Saudi Journal of Biological Sciences*, 29, 3140-3150. <https://doi.org/10.1016/j.sjbs.2022.01.049>
- Lam, P. P. Y., Chua, H., Ekambaram, M., Lo, E. C. M., & Yiu, C. K. Y. (2022). Risk predictors of Early Childhood Caries increment: A systematic review and meta-analysis. *Journal of Evidence-Based Dental Practice*. Advance online publication. <https://doi.org/10.1016/j.jebdp.2022.101732>
- Lam, P. P. Y., Chua, H., Ekambaram, M., Lo, E. C. M., & Yiu, C. K. Y. (2022). Does early childhood caries increase caries development among school children and adolescents? A systematic review and meta-analysis. *International Journal of Environmental Research & Public Health*, 19, 13459. <https://doi.org/10.3390/ijerph192013459>
- Lee, Y.-L., Li, K. C., Yiu, C. K. Y., Boyd, D. H., & Ekambaram, M. (2022). Evaluation of developmentally hypomineralised enamel after surface pretreatment with Papacarie Duo gel and different etching modes: An in vitro SEM and AFM study. *European Archives of Paediatric Dentistry*, 23, 117-131. <https://doi.org/10.1007/s40368-021-00671-w>
- Li, D., Chen, K., Tang, H., Hu, S., Xin, L., Jing, X., ... Mei, L., Cannon, R. D., ... Chen, T. (2022). A logic-based diagnostic and therapeutic hydrogel with multi-stimuli responsiveness to orchestrate diabetic bone regeneration. *Advanced Materials*, 34, 2108430. <https://doi.org/10.1002/adma.202108430>
- Li, J., Wang, Z., Wang, J., Guo, Q., Fu, Y., Dai, Z., ... Cooper, P. R., ... He, W. (2022). Amphiregulin regulates odontogenic differentiation of dental pulp stem cells by activation of mitogen-activated protein kinase and the phosphatidylinositol 3-kinase signaling pathways. *Stem Cell Research & Therapy*, 13(1), 304. <https://doi.org/10.1186/s13287-022-02971-4>
- Liaw, R. D. Y., Ling, D. C. T., Vuli, L. J., Loch, C., & Adam, L. A. (2022). "It's just inappropriate": Harassment of dental students by patients. *Journal of Dental Education*, 86, 605-614. <https://doi.org/10.1002/jdd.12854>
- Liu, Y., Xia, Y.-Y., Zhang, T., Yang, Y., Cannon, R. D., Mansell, T., ... Baker, P. N. (2022). Complex interactions between circulating fatty acid levels, desaturase activities, and the risk of gestational diabetes mellitus: A prospective cohort study. *Frontiers in Nutrition*, 9, 919357. <https://doi.org/10.3389/fnut.2022.919357>
- Loch, C., Hemm, L., Taylor, B., Visser, I. N., & Wiig, Ø. (2022). Microstructure, elemental composition and mechanical properties of enamel and dentine in the polar bear *Ursus maritimus*. *Archives of Oral Biology*, 134, 105318. <https://doi.org/10.1016/j.archoralbio.2021.105318>
- Loh, J. Y., Lim, R. Y. M., Broadbent, J. M., & Duncan, W. J. (2022). Employer and graduate perceptions of the competency of University of Otago dental graduates. *New Zealand Dental Journal*, 118(2), 51-57.
- Lyons, K. M., Cannon, R. D., Beumer, III, J., Bakr, M. M., & Love, R. M. (2022). Microbial analysis of obturators during maxillofacial prosthodontic treatment over an 8-year period. *Cleft Palate-Craniofacial Journal*. Advance online publication. <https://doi.org/10.1177/10556656221104940>
- Mahoney, P., McFarlane, G., Loch, C., White, S., Floyd, B., Dunn, E. C., ... Guatelli-Steinberg, D. (2022). Dental biorhythm is associated with adolescent weight gain. *Communications Medicine*, 2, 99. <https://doi.org/10.1038/s43856-022-00164-x>
- Mamun, A.-A., Bhowmik, S., Sarwar, M. S., Akter, S., Pias, T., Zakaria, M. A., ... Little, D. C. (2022). Preparation and quality characterization of marine small pelagic fish powder: A novel ready-to-use nutritious food product for vulnerable populations. *Measurement: Food*, 8, 100067. <https://doi.org/10.1016/j.meafao.2022.100067>

- Mansoor, A., Khurshid, Z., Mansoor, E., Khan, M. T., Ratnayake, J., & Jamal, A. (2022). Effect of currently available nanoparticle synthesis routes on their biocompatibility with fibroblast cell lines. *Molecules*, 27, 6972. <https://doi.org/10.3390/molecules27206972>
- Mansur, E. K. M., & Thomson, W. M. (2022). Evaluation of the Arabic short-form version of the Family Impact Scale (FIS-8). *International Journal of Paediatric Dentistry*, 32, 101-108. <https://doi.org/10.1111/ipd.12798>
- Mariño, R., Delany, C., Manton, D., Reid, K., Satur, J., Crombie, F., ... Morgan, M. (2022). Preparedness for practice of newly qualified dental professionals in Australia: Educator, employer, and consumer perspectives. *BMC Medical Education*, 22, 396. <https://doi.org/10.1186/s12909-022-03476-7>
- Mariño, R., Priede, A., King, M., Adams, G. G., Sicari, M., & Morgan, M. (2022). Oral health professionals screening for undiagnosed type-2 diabetes and prediabetes: The iDENTify study. *BMC Endocrine Disorders*, 22, 183. <https://doi.org/10.1186/s12902-022-01100-9>
- Mohamad, S. A., Milward, M. R., Hadis, M. A., Kuehne, S. A., & Cooper, P. R. (2022). Blue light photobiomodulation of dental pulp cells. *Lasers in Dental Science*. Advance online publication. <https://doi.org/10.1007/s41547-022-00152-3>
- Mohamed, A., Wafaie, K., Mohammed, H., Mohamed, A. M. A., Xinrui, W., Vandeyska-Radunovic, V., & Yiqiang, Q. (2022). Effect of chlorhexidine mouthwash on gingival health around orthodontic miniscrew implants: A pilot placebo-controlled randomized trial. *Orthodontics & Craniofacial Research*. Advance online publication. <https://doi.org/10.1111/ocr.12596>
- Mohammed, H., Kumar, Jr, R., Bennani, H., Halberstadt, J. B., & Farella, M. (2022). Automated detection of smiles as discrete episodes. *Journal of Oral Rehabilitation*. Advance online publication. <https://doi.org/10.1111/joor.13378>
- Monk, J. H. G., Thomson, W. M., & Tong, D. C. (2022). Trends in maxillofacial fractures in Otago-Southland, New Zealand: 2009-2020. *New Zealand Medical Journal*, 135(1557), 76-87. Retrieved from <https://journal.nzma.org.nz/>.
- Morelli, E. L., Broadbent, J. M., Knight, E. T., Leichter, J. W., & Thomson, W. M. (2022). Does having children affect women's oral health? A longitudinal study. *Journal of Public Health Dentistry*, 82, 31-39. <https://doi.org/10.1111/jphd.12466>
- Nazmul Islam, G. M., Ali, M. A., & Collie, S. (2022). Polydopamine treated and PEDOT: PSS coated wash durable conductive textiles for wearable applications. *Fibers & Polymers*, 23(4), 914-924. <https://doi.org/10.1007/s12221-022-3080-0>
- Negrini, M., Batson, P. B., Smith, A. M., Smith, S. A. F., Prior, D. J., Henry, H., Li, K. C., & Tamberg, Y. (2022). Understanding the crystallographic and nanomechanical properties of bryozoans. *Journal of Structural Biology*. Advance online publication. <https://doi.org/10.1016/j.jsb.2022.107882>
- Niimi, M., Niimi, K., Tanabe, K., Cannon, R. D., & Lamping, E. (2022). Inhibitor resistant mutants give important insights into *Candida albicans* ABC transporter Cdr1 substrate specificity and help elucidate efflux pump inhibition. *Antimicrobial Agents & Chemotherapy*, 66(1), e01748-21. <https://doi.org/10.1128/aac.01748-21>
- Niu, J. Y., Yin, I. X., Wu, W. K. K., Li, Q.-L., Mei, M. L., & Chu, C. H. (2022). Efficacy of the dual-action GA-KR12 peptide for remineralising initial enamel caries: An in vitro study. *Clinical Oral Investigations*, 26, 2441-2451. <https://doi.org/10.1007/s00784-021-04210-1>
- Olliver, S. J., Broadbent, J. M., Prasad, S., Cai, C., Thomson, W. M., & Farella, M. (2022). Changes in incisor relationship over the life course: Findings from a cohort study. *Journal of Dentistry*, 117, 103919. <https://doi.org/10.1016/j.jdent.2021.103919>
- Olson, H., Ratnayake, J., Senthilkumar, A., Quaranta, A., & Meldrum, A. (2022). Working characteristics for practicing dental hygienists in two countries in different hemispheres. *International Journal of Dental Hygiene*, 20, 209-218. <https://doi.org/10.1111/idh.12538>
- Oude-Alink, C., Hussaini, H. M., Seo, B., & Firth, F. (2022). Regulatory compliance of online vendor selling dental whitening products in New Zealand. *Journal of the Royal Society of New Zealand*. Advance online publication.
- Paul, N. L., Adam, L. A., & Moffat, S. M. (2022). Dental students' perceptions of the long case. *European Journal of Dental Education*, 26, 446-452. <https://doi.org/10.1111/eje.12719>
- Pelepenko, L. E., Marciano, M. A., Francati, T. M., Bombarda, G., Antunes, T. B. M., Sorrentino, F., ... Cooper, P. R., ... Camilleri, J. (2022). Can strontium replace calcium in bioactive materials for dental applications? *Journal of Biomedical Materials Research Part A*. Advance online publication. <https://doi.org/10.1002/jbm.a.37421>
- Phua, E. M. J., Waddell, J. N., & Choi, J. J. E. (2022). Curing through ceramics: Influence of different light-curing units and curing modes on bond strength. *Oral*, 2, 62-74. <https://doi.org/10.3390/oral2010008>
- Polonowita, A., Guan, G., Thomson, W. M., & Martin-Hendrie, R. (2022). Using telehealth for oral medicine patient management during the COVID-19 lockdown. *Oral Surgery*, 15, 291-304. <https://doi.org/10.1111/ors.12721>

- Poma, M., Al Amri, F., Tawse-Smith, A., & Ma, S. (2022). How are you coping with the COVID-19 pandemic? Survey of undergraduate dental students' wellbeing during an unexpected global event. *European Journal of Dental Education*, 26, 459-467. <https://doi.org/10.1111/eje.12721>
- Pong, M. T., Grymak, A., Waddell, J. N., & Choi, J. J. E. (2022). Bond strength between CAD/CAM PMMA denture base resins and characterisation composites. *Oral*, 2, 75-87. <https://doi.org/10.3390/oral2010009>
- Porter, G. C., Abdelmoneim, D., Li, K. C., Duncan, W. J., & Coates, D. E. (2022). The effect of low-temperature thermal processing on bovine hydroxyapatite bone substitutes, toward bone cell interaction and differentiation. *Materials*, 15, 2504. <https://doi.org/10.3390/ma15072504>
- Prasad, S., Denotti, G., & Farella, M. (2022). Effect of prior knowledge about treatment on cephalometric measurements. *Journal of Orthodontics*. Advance online publication. <https://doi.org/10.1177/14653125221094333>
- Rajabi, M., Cabral, J., Saunderson, S., & Ali, M. A. (2022). Green synthesis of chitooligosaccharide-PEGDA derivatives through aza-Michael reaction for biomedical applications. *Carbohydrate Polymers*, 295, 119884. <https://doi.org/10.1016/j.carbpol.2022.119884>
- Ratnayake, J., Guan, G., Polonowita, A., Gray, A. R., Loch, C., Li, K. C., Waddell, J. N., Lyons, K., & Brunton, P. A. (2022). Measuring changes in jaw opening forces to assess the degree of improvement in patients with temporomandibular disorders. *Applied Sciences*, 12(3), 1224. <https://doi.org/10.3390/app12031224>
- Ratnayake, J., Veerasamy, A., Ahmed, H., Coburn, D., Loch, C., Gray, A. R., Lyons, K. M., Heng, N. C. K., Cannon, R. D., ... Brunton, P. A. (2022). Clinical and microbiological evaluation of a chlorhexidine-modified glass ionomer cement (GIC-CHX) restoration placed using the atraumatic restorative treatment (ART) technique. *Materials*, 15, 5044. <https://doi.org/10.3390/ma15145044>
- Ruhe, T., Broadbent, J. M., Schluter, P. J., Bowden, N., Theodore, R., Richards, R., & Kokaua, J. (2022). Parents' education and Pasifika children's oral health in Aotearoa/New Zealand: A national linked data study using Aotearoa/New Zealand's integrated data infrastructure. *Community Dentistry & Oral Epidemiology*. Advance online publication. <https://doi.org/10.1111/cdoe.12791>
- Ruiz, B., Broadbent, J. M., Thomson, W. M., Ramrakha, S. K., Boden, J., Horwood, L. J., & Poulton, R. (2022). Childhood caries experience in two Aotearoa New Zealand birth cohorts: Implications for research, policy and practice. *Journal of the Royal Society of New Zealand*, 52(3), 265-282. <https://doi.org/10.1080/03036758.2022.2061018>
- Ruiz, B., Broadbent, J. M., Thomson, W. M., Ramrakha, S., Boden, J., Horwood, J., & Poulton, R. (2022). Is childhood oral health the 'canary in the coal mine' for poor adult general health? Findings from two New Zealand birth cohort studies. *Community Dentistry & Oral Epidemiology*. Advance online publication. <https://doi.org/10.1111/cdoe.12772>
- Ruma, Y. N., Keniya, M. V., & Monk, B. C. (2022). Exploring *Cryptococcus neoformans* CYP51 and its cognate reductase as a drug target. *Journal of Fungi*, 8, 1256. <https://doi.org/10.3390/jof8121256>
- Ruma, Y. N., Keniya, M. V., Tyndall, J. D. A., & Monk, B. C. (2022). Characterisation of *Candida parapsilosis* CYP51 as a drug target using *Saccharomyces cerevisiae* as host. *Journal of Fungi*, 8(1), 69. <https://doi.org/10.3390/jof8010069>
- Salem, A. S., Tompkins, G. R., & Cathro, P. R. (2022). Alkaline tolerance and biofilm formation of root canal isolates of *Enterococcus faecalis*: An in vitro study. *Journal of Endodontics*. Advance online publication. <https://doi.org/10.1016/j.joen.2022.01.006>
- Saliem, S. S., Bede, S. Y., Abdulkareem, A. A., Abdullah, B. H., Milward, M. R., & Cooper, P. R. (2022). Gingival tissue samples from periodontitis patients demonstrate epithelial-mesenchymal transition phenotype. *Journal of Periodontal Research*. Advance online publication. <https://doi.org/10.1111/jre.13086>
- Saliem, S. S., Bede, S. Y., Cooper, P. R., Abdulkareem, A. A., Milward, M. R., & Abdullah, B. H. (2022). Pathogenesis of periodontitis: A potential role for epithelial-mesenchymal transition. *Japanese Dental Science Review*, 58, 268-278. <https://doi.org/10.1016/j.jdsr.2022.09.001>
- Sardana, D., Ekambaram, M., Yang, Y., McGrath, C. P., & Yiu, C. K. Y. (2022). Caries-preventive effectiveness of two different fluoride varnishes: A randomised clinical trial in patients with multi-bracketed fixed orthodontic appliances. *International Journal of Paediatric Dentistry*. Advance online publication. <https://doi.org/10.1111/ipd.13013>



- Sardana, D., Li, K. Y., Ekambaram, M., Yang, Y., McGrath, C. P., & Yiu, C. K. Y. (2022). Validation of clinical photography and a laser fluorescence device for assessment of enamel demineralization during multi-bracketed fixed orthodontic treatment. *Photodiagnosis & Photodynamic Therapy*, 38, 102828. <https://doi.org/10.1016/j.pdpdt.2022.102828>
- Scott, N., Cathro, P. R., & Thomson, W. M. (2022). Presentation and subsequent care of dental injuries sustained by New Zealand adults. *Community Dentistry & Oral Epidemiology*. Advance online publication. <https://doi.org/10.1111/cdoe.12799>
- Seo, B., Coates, D. E., Lewis, J., Seymour, G. J., & Rich, A. (2022). Unfolded protein response is involved in the metabolic and apoptotic regulation of oral squamous cell carcinoma. *Pathology*. Advance online publication. <https://doi.org/10.1016/j.pathol.2022.04.003>
- Seto, T. H., Grymak, A., Mudliar, V., & Choi, J. J. E. (2022). Effect of enamel bleaching on the bond strength of ceramic: A systematic review. *Oral*, 2, 182-197. <https://doi.org/10.3390/oral2020018>
- Shi, C., Feng, Y., Hsiao, Y.-C., Smith, J., Jin, C., Farella, M., & Mei, L. (2022). Clear aligners brands and marketing claims: An overview of available information on the web. *Australasian Orthodontic Journal*, 38(2), 252-262. <https://doi.org/10.2478/aoj-2022-0025>
- Singh, R. G., Lyons, K. M., Waddell, J. N., & Li, K. C. (2022). Effect of thermocycling on the mechanical properties, inorganic particle release and low temperature degradation of glazed high translucent monolithic 3Y-TZP dental restorations. *Journal of the Mechanical Behavior of Biomedical Materials*, 136, 105495. <https://doi.org/10.1016/j.jmbbm.2022.105495>
- Skilbeck, M. G., Mei, L., Mohammed, H., Cannon, R. D., & Farella, M. (2022). The effect of ligation methods on biofilm formation in patients undergoing multi-bracketed fixed orthodontic therapy: A systematic review. *Orthodontics & Craniofacial Research*, 25, 14-30. <https://doi.org/10.1111/ocr.12503>
- Smith, L., Smith, M., & Thomson, W. M. (2022). Recommendations for improving dental care for dentate home-based older people: A qualitative New Zealand study. *Gerodontology*, 39, 187-196. <https://doi.org/10.1111/ger.12553>
- Smith, J. M., Weir, T., Kang, A., & Farella, M. (2022). Predictability of lower incisor tip using clear aligner therapy. *Progress in Orthodontics*, 23(1), 37. <https://doi.org/10.1186/s40510-022-00433-4>
- Sobuj, M. K. A., Rabby, A. F., Rahman, S., Hasan, S. J., Bhowmik, S., Islam, M. A., ... Mamun, A.-A. (2022). Knowledge, attitudes, and practices on food safety and hygiene of wet and dry fish handlers in Cox's Bazar, Bangladesh. *Food Science & Nutrition*, 10, 4139-4154. <https://doi.org/10.1002/fsn3.3004>
- Sood, Z. M., Nik-Azis, N. M., Baharin, B., Zainuddin, Z. M., Razali, M., & Hussaini, H. M. (2022). An insight into the role of periodontitis as a potential risk factor for development of erectile dysfunction. *Archives of Orofacial Sciences*, 17(Suppl. 1), 107-118. <https://doi.org/10.21315/aos2022.17S1.OA08>
- Steel, S., Percy, Q., Li, K. C., Scholze, M., & Zwirner, J. (2022). The relationship between the pH value of a hydration solution and the biomechanical properties of Crosado-embalmed human iliotibial bands. *Journal of the Mechanical Behavior of Biomedical Materials*. Advance online publication. <https://doi.org/10.1016/j.jmbbm.2022.105266>
- Tay, W. Z., Broadbent, J. M., Tay, Y. H., & Brown, A. (2022). Changes in oral health-related quality of life following dental care at the Canterbury Charity Hospital. *New Zealand Dental Journal*, 118(4), 126-133.
- Tay, W. Z., Dong, F., Kalmadin, N. I., Hussaini, H. M., De Silva, H. L., & Rich, A. M. (2022). PD-L1 expression in non-dysplastic, dysplastic and oral squamous cell carcinoma samples. *New Zealand Dental Journal*, 118(1), 15-24.
- Thomson, W. M., Foster Page, L. A., Levy, S. M., Keels, M. A., Hara, A. T., & Fontana, M. (2022). Concurrent validity of the short-form Family Impact Scale (FIS-8) in 4-year-old US children. *BMC Pediatrics*, 22(1), 391. <https://doi.org/10.1186/s12887-022-03437-5>
- Tieh, M. T., Waddell, J. N., & Choi, J. J. E. (2022). Optical properties and color stability of denture teeth: A systematic review. *Journal of Prosthodontics*, 31, 385-398. <https://doi.org/10.1111/jopr.13429>
- Tieh, M. T., Waddell, J. N., & Choi, J. J. E. (2022). Optical and mechanical properties of conventional, milled and 3D-printed denture teeth. *Journal of the Mechanical Behavior of Biomedical Materials*, 126, 105061. <https://doi.org/10.1016/j.jmbbm.2021.105061>
- Towle, I., Irish, J. D., Sabbi, K. H., & Loch, C. (2022). Dental caries in wild primates: Interproximal cavities on anterior teeth. *American Journal of Primatology*, 84, e23349. <https://doi.org/10.1002/ajp.23349>

- Treharne, G. J., Gamble Blakey, A., Graham, K., Carrington, S. D., McLachlan, L. A., Withey-Rila, C., Pearman-Beres, L., & Anderson, L. (2022). Perspectives on expertise in teaching about transgender healthcare: A focus group study with health professional programme teaching staff and transgender community members. *International Journal of Transgender Health*, 23(3), 334-354. <https://doi.org/10.1080/26895269.2020.1870189>
- Veerasamy, A., Lyons, K., Crabtree, I., & Brunton, P. (2022). Knowledge of nursing graduates on oral health care for older people in the long-term care. *Journal of Dental Education*, 86, 830-838. <https://doi.org/10.1002/jdd.12895>
- Virdee, S. S., Bashir, N., Cooper, P. R., & Tomson, P. L. (2022). Exploiting dentine matrix proteins in cell-free approaches for periradicular tissue engineering. *Tissue Engineering Part B: Reviews*, 28(4), 707-732. <https://doi.org/10.1089/ten.TEB.2021.0074>
- Wafaie, K., Mohammed, H., Mohamed, A. M., Zhou, J., Daniel, B., & Yiqiang, Q. (2022). A qualitative study of orthodontic patients' experiences in quarantine during the COVID-19 pandemic outbreak. *American Journal of Orthodontics & Dentofacial Orthopedics*, 161(5), e498-e506. <https://doi.org/10.1016/j.ajodo.2021.11.010>
- Wang, D., Firth, F., Bennani, F., Farella, M., & Mei, L. (2022). Immediate effect of clear aligners and fixed appliances on perioral soft tissues and speech. *Orthodontics & Craniofacial Research*. Advance online publication. <https://doi.org/10.1111/ocr.12625>
- Wang, Q., Li, Y., Meng, Q., Meng, J., & Mei, M. L. (2022). Effect of Er:YAG laser irrigation with different etching modes on the push-out bond strength of fiber posts to the root dentine. *Lasers in Medical Science*. Advance online publication. <https://doi.org/10.1007/s10103-022-03542-y>
- Wang, C., Lucas, R., Milward, M., & Cooper, P. R. (2022). Impact of particle morphology on abrasion, polishing and stain removal efficacy in a tooth cleaning model system. *Biotribology*, 100218. Advance online publication. <https://doi.org/10.1016/j.biotri.2022.100218>
- Wang, T., Zhao, R., Yang, R., Li, Y., Lien, H. L., Mei, L., & Nogueira, G. (2022). Perceptions of NZ orthodontists and periodontists on the management of gingival recession in orthodontic patients. *Australian Dental Journal*. Advance online publication. <https://doi.org/10.1111/adj.12914>
- Warner, C., Hasmun, N. N., Elcock, C., Lawson, J. A., Vettore, M. V., & Rodd, H. D. (2022). Making white spots disappear! Do minimally invasive treatments improve incisor opacities in children with molar incisor hypomineralisation? *International Journal of Paediatric Dentistry*. Advance online publication. <https://doi.org/10.1111/ipd.12940>
- Weatherly, K., Brunton, P., Loch, C., McKeage, J. W., Ruddy, B. P., Taberner, A. J., & White, D. E. (2022). Case study of user experience-driven design in a new local anaesthetic dentistry jet injection device. *Journal of the Royal Society of New Zealand*. Advance online publication. <https://doi.org/10.1080/03036758.2022.2113809>
- Xu, L., Li, H., Mei, L., Li, Y., Wo, P., & Li, Y. (2022). Aligner treatment: Patient experience and influencing factors. *Australasian Orthodontic Journal*, 38(1), 88-95. <https://doi.org/10.21307/aoj-2022.008>
- Xu, L., Mei, L., Lu, R., Li, Y., Li, H., & Li, Y. (2022). Predicting patient experience of Invisalign treatment: An analysis using artificial neural network. *Korean Journal of Orthodontics*, 52(4), 268-277. <https://doi.org/10.4041/kjod21.255>
- Xu, X., Zhu, J., Mei, M. L., Wu, H., Xie, K., Wang, S., & Chen, Y. (2022). Exploration and preliminary clinical investigation of an adhesive approach for primary tooth restoration. *Journal of Biomedical Research*, 37(2), 138-147. <https://doi.org/10.7555/jbr.36.20220188>
- Yong, D., Choi, J. J. E., Cathro, P., Cooper, P. R., Dias, G., Huang, J., & Ratnayake, J. (2022). Development and analysis of a hydroxyapatite supplemented calcium silicate cement for endodontic treatment. *Materials*, 15(3), 1176. <https://doi.org/10.3390/ma15031176>
- Yoshida, M., Turner, P. R., McAdam, C. J., Ali, M. A., & Cabral, J. D. (2022). A comparison between  $\beta$ -tricalcium phosphate versus chitosan polycaprolactone-based 3D melt extruded composite scaffolds. *Biopolymers*, 113, e23482. <https://doi.org/10.1002/bip.23482>
- Yu, S., De Silva, H., Narsinh, P., Marra, J., Fong, A., & Dias, G. (2022). Assessing the feasibility of using autogenous maxillary bone graft to repair isolated orbital floor fractures: A pilot study using CT measurements. *Oral Surgery*. Advance online publication. <https://doi.org/10.1111/ors.12756>
- Yu, W. W., Goh, R., Cheong, E., Guan, G., Jin, C., Cannon, R. D., Farella, M., & Mei, L. (2022). Prevalence of halitosis among young adults in Dunedin, New Zealand. *International Journal of Dental Hygiene*, 20, 700-707. <https://doi.org/10.1111/idh.12609>

- Zheng, J., Aarts, J. M., Ma, S., Waddell, J. N., & Choi, J. J. E. (2022). Different undercut depths influence on fatigue behavior and retentive force of removable partial denture clasp materials: A systematic review. *Journal of Prosthodontics*. Advance online publication. <https://doi.org/10.1111/jopr.13519>
- Zheng, J., Aarts, J. M., Ma, S., Waddell, J. N., & Choi, J. J. E. (2022). Fatigue behavior of removable partial denture cast and laser-sintered cobalt-chromium (CoCr) and polyetheretherketone (PEEK) clasp materials. *Clinical & Experimental Dental Research*, 8, 1496-1504. <https://doi.org/10.1002/cre2.645>
- Zhong, W., Wang, X., Yang, L., Wang, Y., Xiao, Q., Yu, S., Cannon, R. D., ... Song, J. (2022). Nanocarrier-assisted delivery of metformin boosts remodeling of diabetic periodontal tissue via cellular exocytosis-mediated regulation of endoplasmic reticulum homeostasis. *ACS Nano*. Advance online publication. <https://doi.org/10.1021/acsnano.2c08146>
- Zhu, J., Song, G., Zhou, X., Han, T.-L., Yu, X., Chen, H., ... Cannon, R. D., ... Zhang, H. (2022). CD39/CD73 dysregulation of adenosine metabolism increases decidual natural killer cell cytotoxicity: Implications in unexplained recurrent spontaneous abortion. *Frontiers in Immunology*, 13, 813218. <https://doi.org/10.3389/fimmu.2022.813218>
- Zwirner, J., & Duncan, W. (2022). A disaster victim identification workshop focused on forensic odontology using embalmed human remains. *International Journal of Legal Medicine*, 136, 1801-1809. <https://doi.org/10.1007/s00414-022-02790-5>
- COVIDSurg Collaborative, and GlobalSurg Collaborative, including, Wright, D., Kieser, D., Rennie, S., Clifford, Z., Frizelle, F., Glyn, T., Lim, E., Lyons, O., O'Grady, M., Roake, J., Ailabouni, R., Alqassab, M., Amer, M., Haddow, J., Hawkins, R., Oliver, T., Saw, K. S., Gaston, M., & Haimona, M. (2021). SARS-CoV-2 vaccination modelling for safe surgery to save lives: Data from an international prospective cohort study. *British Journal of Surgery*, 108, 1056-1063. <https://doi.org/10.1093/bjs/znab101>
- Aarts, J. M., Choi, J. J. E., Metcalfe, S., & Bennani, V. (2021). Influence of build angulation on the mechanical properties of a direct-metal laser-sintered cobalt-chromium used for removable partial denture frameworks. *Journal of Prosthetic Dentistry*, 126, 224-230. <https://doi.org/10.1016/j.prosdent.2020.06.014>
- Acharya, S., Acharya, S., Pentapati, K. C., & Thomson, W. M. (2021). Nicotine dependence and its association with health utility ratings among a sample of Indian dental patients. *Community Dentistry & Oral Epidemiology*, 49, 574-580. <https://doi.org/10.1111/cdoe.12629>
- Aghoghovwia, B. E., Okpe, O., McIntyre, E. A., Taniyohwo, E. M., & Ratnayake, J. T. (2021). A brief review on erythropoietin and mesenchymal stem cell therapies for paediatric neurological disorders. *Current Stem Cell Reports*, 7, 95-107. <https://doi.org/10.1007/s40778-021-00189-3>
- Al-Ani, A. H., Antoun, J. S., Thomson, W. M., Topless, R., Merriman, T. R., & Farella, M. (2021). Common variants of EDA are associated with non-syndromic hypodontia. *Orthodontics & Craniofacial Research*, 24, 155-163. <https://doi.org/10.1111/ocr.12419>
- Al-Kindi, F., Al-Harrasi, R., Coimbatore, H., Aziz, S., Thomson, W. M., & Ekambaram, M. (2021). The selection and clinical application of dental adhesives by general dental practitioners in New Zealand. *New Zealand Dental Journal*, 117(2), 74-79.
- Alansary, M., Drummond, B., & Coates, D. (2021). Immunocytochemical characterisation of primary teeth pulp stem cells from resorbing teeth cultured in serum-free medium. *Dental Traumatology*, 37, 90-102. <https://doi.org/10.1111/edt.12607>
- Ali, M. A., & Bhuiyan, M. H. (2021). Types of biomaterials useful in brain repair. *Neurochemistry International*, 146, 105034. <https://doi.org/10.1016/j.neuint.2021.105034>
- Ali, A., & Gould, M. (2021). Untapped potentials of hazardous nanoarchitectural biopolymers. *Journal of Hazardous Materials*, 411, 124740. <https://doi.org/10.1016/j.jhazmat.2020.124740>
- Alves Melo, I. M., Pereira Viana, M. R., Pupin, B., Bhattacharjee, T. T., & de Azevedo Canevari, R. (2021). PCR-RFLP and FTIR-based detection of high-risk human papilloma virus for cervical cancer screening and prevention. *Biochemistry & Biophysics Reports*, 26, 100993. <https://doi.org/10.1016/j.bbrep.2021.100993>
- Aral, K., Milward, M. R., & Cooper, P. R. (2021). Gene expression profiles of mitochondria-endoplasmic reticulum tethering in human gingival fibroblasts in response to periodontal pathogens. *Archives of Oral Biology*, 128, 105173. <https://doi.org/10.1016/j.archoralbio.2021.105173>
- Arruda-Vasconcelos, R., Louzada, L. M., Feres, M., Tomson, P. L., Cooper, P. R., & Gomes, B. P. F. A. (2021). Investigation of microbial profile, levels of endotoxin and lipoteichoic acid in teeth with symptomatic irreversible pulpitis: A clinical study. *International Endodontic Journal*, 54, 46-60. <https://doi.org/10.1111/iej.13402>
- Atieh, M. A., Alali, F., & Alsabeeha, N. H. M. (2021). Outcome of supportive peri-implant therapy on the rates of peri-implant diseases and marginal bone loss: A systematic review and meta-analysis. *Quintessence International*, 52(2), 122-131. <https://doi.org/10.3290/j.qi.a45428>



- Atieh, M. A., Alfardan, L., & Alsabeeha, N. H. M. (2021). Flapped versus flapless alveolar ridge preservation: A systematic review and meta-analysis. *International Journal of Oral & Maxillofacial Surgery*. <https://doi.org/10.1016/j.ijom.2021.05.023>
- Atieh, M. A., Alsabeeha, N. H. M., Payne, A. G. T., Faggion, Jr, C. M., & Esposito, M. (2021). Interventions for replacing missing teeth: Alveolar ridge preservation techniques for dental implant site development (Review). *Cochrane Database of Systematic Reviews*, 4, CD10176. <https://doi.org/10.1002/14651858.CD010176.pub3>
- Atieh, M. A., Baqain, Z. H., Tawse-Smith, A., Ma, S., Almoselli, M., Lin, L., & Alsabeeha, N. H. M. (2021). The influence of insertion torque values on the failure and complication rates of dental implants: A systematic review and meta-analysis. *Clinical Implant Dentistry & Related Research*, 23, 341-360. <https://doi.org/10.1111/cid.12993>
- Atieh, M. A., Shah, M., Abdulkareem, M., AlQahtani, H. A., & Alsabeeha, N. H. M. (2021). The socket shield technique for immediate implant placement: A systematic review and meta-analysis. *Journal of Esthetic & Restorative Dentistry*, 33, 1186-1200. <https://doi.org/10.1111/jerd.12812>
- Bidinotto, A. B., Martinez-Steele, E., Cunha-Cruz, J., Thomson, W. M., Hugo, F. N., & Hilgert, J. B. (2021). Food processing and its association with dental caries: Data from NHANES 2011-2014. *Community Dentistry & Oral Epidemiology*, 49, 565-573. <https://doi.org/10.1111/cdoe.12628>
- Bijle, M. N., Abdalla, M. M., Ashraf, U., Ekambaram, M., & Yiu, C. K. Y. (2021). Enamel remineralization potential of arginine-fluoride varnish in a multi-species bacterial pH-cycling model. *Journal of Dentistry*, 104, 103528. <https://doi.org/10.1016/j.jdent.2020.103528>
- Bijle, M. N., Ekambaram, M., Lo, E. C. M., & Yiu, C. K. Y. (2021). Combined effect of arginine and fluoride on the growth of *Lactobacillus rhamnosus* GG. *Scientific Reports*, 11, 973. <https://doi.org/10.1038/s41598-020-79684-2>
- bin Haji Awang Masri, A. A., Khang, K. K. Y., Low Wei Shen, L., Ekambaram, M., & Loch, C. (2021). Knowledge of dental enamel defects among undergraduate dental students a cross sectional survey. *European Journal of Dental Education*, 25, 711-716. <https://doi.org/10.1111/eje.12650>
- Boyd, D. H., Thomson, W. M., Leon de la Barra, S., Fuge, K. N., van den Heever, R., Butler, B. M., ... Foster Page, L. A. (2021). A primary care randomized controlled trial of Hall and conventional restorative techniques. *JDR Clinical & Translational Research*, 6(2), 205-212. <https://doi.org/10.1177/2380084420933154>
- Boyd, D. H., Zhang, Y., Smith, L., Adam, L., Foster Page, L., & Thomson, W. M. (2021). Caregivers' understanding of informed consent in a randomized control trial. *Journal of Bioethical Inquiry*, 18, 141-150. <https://doi.org/10.1007/s11673-020-10085-w>
- Broadbent, J. M., Cahi, A. H. J., Chong, J. B., Korduke, N. A., Lindsay, R. J., Cathro, P., & Schwass, D. R. (2021). Outcomes for teeth following pulpectomy treatment at a dental teaching hospital. *New Zealand Dental Journal*, 117(1), 23-30.
- Broughton, J. R., Thomson, W. M., Maipi, J. T., Person, M., Morgaine, K. C., Jamieson, L. M., & Lawrence, H. P. (2021). Mokopuna Māori me oranga niho (Māori infants and oral health) and early childhood caries randomised control trial among New Zealand Māori children. *New Zealand Dental Journal*, 117(3), 129-136.
- Brunton, P. A., Ratnayake, J., Bodansky, H. J., Mei, L., Veerasamy, A., & Hall, R. (2021). An intraoral device for weight loss: Initial clinical findings. *British Dental Journal*. Advance online publication. <https://doi.org/10.1038/s41415-021-3081-1>
- Cericato, G. O., Agostini, B. A., dos Santos Costa, F., Thomson, W. M., & Demarco, F. F. (2021). Rural-urban differences in oral health among older people in Southern Brazil. *Brazilian Oral Research*, 35, e135. <https://doi.org/10.1590/1807-3107bor-2021.vol35.0135>
- Chai, S. Y., Bennani, V., Aarts, J. M., Lyons, K., & Das, R. (2021). Stress distribution within the ceramic veneer-tooth system with butt joint and feathered edge incisal preparation designs. *Journal of Esthetic & Restorative Dentistry*, 33, 496-502. <https://doi.org/10.1111/jerd.12655>
- Cheah, C., Lim, C., & Ma, S. (2021). The dentist will scan you now: The next generation of digital-savvy graduates. *European Journal of Dental Education*, 25, 232-237. <https://doi.org/10.1111/eje.12596>
- Cheng, M. S., Hsu, K.-H., Thomson, W. M., & Ekambaram, M. (2021). General dental practitioners' opinions on universal publicly-funded dental care in New Zealand. *New Zealand Dental Journal*, 117(1), 35-39.
- Choi, J. J. E., Chen, S., & Waddell, J. N. (2021). Investigation of dental elastomers as oral mucosa simulant materials. *Clinical & Experimental Dental Research*, 7, 754-762. <https://doi.org/10.1002/cre2.399>
- Choi, J. J. E., Plaksina, P., Foster Page, L., Waddell, J. N., & Duncan, W. J. (2021). A novel tooth-colored crown system to treat dental caries in children: Development and validation. *New Zealand Dental Journal*, 117(2), 55-65.

- Chutipongpisit, K., Parachuru, V. P., Friedlander, L. T., Hussaini, H. M., & Rich, A. M. (2021). Immunohistochemical and immunofluorescence expression profile of lymphatic endothelial cell markers in oral cancer. *International Journal of Experimental Pathology*, 102, 268-278. <https://doi.org/10.1111/iep.12411>
- Cullum, S., Varghese, C., Yates, S., Kalauta, L., Appleton, J., Knell, R., ... Christie, M., Appleton, K., Hadfield, L., ... Cheung, G. (2021). Predictors of aged residential care placement in patients newly diagnosed with dementia at a New Zealand memory service. *Journal of Long-Term Care*, 24-32. <https://doi.org/10.31389/jltc.46>
- Dai, L. L., Mei, M. L., Chu, C. H., & Lo, E. C. M. (2021). Remineralizing effect of a new strontium-doped bioactive glass and fluoride on demineralized enamel and dentine. *Journal of Dentistry*, 108, 103633. <https://doi.org/10.1016/j.jdent.2021.103633>
- Dai, L.-L., Mei, M.-L., Chu, C.-H., Zhao, I. S., & Lo, E. C.-M. (2021). Effect of strontium-doped bioactive glass on preventing formation of demineralized lesion. *Materials*, 14, 4645. <https://doi.org/10.3390/ma14164645>
- Dai, L. L., Nudelman, F., Chu, C. H., Lo, E. C. M., & Mei, M. L. (2021). The effects of strontium-doped bioactive glass and fluoride on hydroxyapatite crystallization. *Journal of Dentistry*, 105, 103581. <https://doi.org/10.1016/j.jdent.2021.103581>
- Dixon, H. G., Thomson, W. M., & Ting, G. S. (2021). Dentists' knowledge and experiences of treating patients with head and neck cancer. *New Zealand Dental Journal*, 117(1), 15-21.
- Dong, Z., Li, C., & Coates, D. (2021). PTN-PTPRZ signalling is involved in deer antler stem cell regulation during tissue regeneration. *Journal of Cellular Physiology*, 236, 3752-3769. <https://doi.org/10.1002/jcp.30115>
- Dresser, J., Barazanchi, A., Meldrum, A., Marra, C., & Wilby, K. J. (2021). Identifying perceptions and themed learning outcomes between pharmacy and dentistry students through interprofessional education and collaboration in the dental clinic. *Currents in Pharmacy Teaching & Learning*, 13, 843-847. <https://doi.org/10.1016/j.cptl.2021.03.012>
- Elani, H. W., Batista, A. F. M., Thomson, W. M., Kawachi, I., & Chiavegatto Filho, A. D. P. (2021). Predictors of tooth loss: A machine learning approach. *PLoS ONE*, 16(6), e0252873. <https://doi.org/10.1371/journal.pone.0252873>
- Elliott, M. L., Caspi, A., Houts, R. M., Ambler, A., Broadbent, J. M., Hancox, R. J., ... Hogan, S., Keenan, R., ... Melzer, T. R., ... Ramrakha, S., ... Righarts, A., ... Thomson, W. M., Thorne, P. R., ... Wilson, G., ... Poulton, R., & Moffitt, T. E. (2021). Disparities in the pace of biological aging among midlife adults of the same chronological age have implications for future frailty risk and policy. *Nature Aging*, 1(3), 295-308. <https://doi.org/10.1038/s43587-021-00044-4>
- Ford, P. J., & Rich, A. M. (2021). Tobacco use and oral health. *Addiction*, 116, 3531-3540. <https://doi.org/10.1111/add.15513>
- Ganjigatti, R. R., Bennani, V., Aarts, J. M., Choi, J. J. E., & Brunton, P. A. (2021). Efficacy and safety of Botulinum toxinA for improving esthetics in facial complex: A systematic review. *Brazilian Dental Journal*, 32(4), 31-44. <https://doi.org/10.1590/0103-6440202104127>
- Garde, S., Adam, L. A., & Tawse-Smith, A. (2021). Perceived stressors of undergraduate dental students at an Australasian dental school. *IIUM Journal of Orofacial & Health Sciences*, 2(2), 107-119. <https://doi.org/10.31436/ijohs.v2i2.99>
- Gleneadie, H. J., Baker, A. H., Batis, N., Bryant, J., Jiang, Y., Clokie, S. J. H., ... Cooper, P. R., ... Wiench, M. (2021). The anti-tumour activity of DNA methylation inhibitor 5-aza-2'-deoxycytidine is enhanced by the common analgesic paracetamol through induction of oxidative stress. *Cancer Letters*, 501, 172-186. <https://doi.org/10.1016/j.canlet.2020.12.029>
- Graham, D. O., Wilson, R. K., Ruma, Y. N., Keniya, M. V., Tyndall, J. D. A., & Monk, B. C. (2021). Structural insights into the azole resistance of the *Candida albicans* Darlington strain using *Saccharomyces cerevisiae* lanosterol 14 $\alpha$ -demethylase as a surrogate. *Journal of Fungi*, 7, 897. <https://doi.org/10.3390/jof7110897>
- Gray, L., McNeill, L., Yi, W., Zvonareva, A., Brunton, P., & Mei, L. (2021). The "business" of dentistry: Consumers' (patients') criteria in the selection and evaluation of dental services. *PLoS ONE*, 16(8), e0253517. <https://doi.org/10.1371/journal.pone.0253517>
- Grymak, A., Aarts, J. M., Ma, S., Waddell, J. N., & Choi, J. J. E. (2021). Comparison of hardness and polishability of various occlusal splint materials. *Journal of the Mechanical Behavior of Biomedical Materials*, 115, 104270. <https://doi.org/10.1016/j.jmbbm.2020.104270>
- Grymak, A., Chen, S., Mudliar, V. L., Li, K. C., & Waddell, J. N. (2021). The influence of kava and carbonated soft drink on the mechanical properties of denture base resins. *New Zealand Dental Journal*, 117(4), 193-201.

- Ha, D. H., Spencer, A. J., Moynihan, P., Thomson, W. M., & Do, L. G. (2021). Excess risk of dental caries from higher free sugars intake combined with low exposure to water fluoridation. *Journal of Dental Research*, 100(11), 1243-1250. <https://doi.org/10.1177/00220345211007747>
- Hasheminejad, N., Hajizamani, H., Malek, M. T., & Thomson, W. M. (2021). Personality characteristics and oral health-related quality of life in an Iranian adult population. *International Journal of Dentistry*, 2021, 6619123. <https://doi.org/10.1155/2021/6619123>
- Holden, A. C. L., Adam, L., & Thomson, W. M. (2021). Rationalisation and 'McDonaldisation' in dental care: Private dentists' experiences working in corporate dentistry. *British Dental Journal*. Advance online publication. <https://doi.org/10.1038/s41415-021-3071-3>
- Holden, A. C. L., Adam, L., & Thomson, M. (2021). Private practice dentists' views of oral health injustice. *Community Dental Health*, 38, 268-274. [https://doi.org/10.1922/CDH\\_00009Holden07](https://doi.org/10.1922/CDH_00009Holden07)
- Hyland, N. F., Smith, M. B., & Thomson, W. M. (2021). The residual dentition among home-based older New Zealanders receiving living support. *Gerodontology*. <https://doi.org/10.1111/ger.12558>
- Idris, G., Smith, C., Galland, B., Taylor, R., Robertson, C. J., Bennani, H., & Farella, M. (2021). Relationship between chewing features and body mass index in young adolescents. *Pediatric Obesity*, 16, e12743. <https://doi.org/10.1111/ijpo.12743>
- Idris, G., Smith, C., Galland, B., Taylor, R., Robertson, C. J., & Farella, M. (2021). Home-based monitoring of eating in adolescents: A pilot study. *Nutrients*, 13(12), 4354. <https://doi.org/10.3390/nu13124354>
- Islam, S., Bhowmik, S., Hossain, M. K., Nordin, N., Rahman, M., Ahmmed, M. K., ... Hossain, M. A. (2021). Tilapia from most of the sources in Bangladesh are safe for human consumption: A hazard index (HI) based study on heavy metals. *Journal of Aquatic Food Product Technology*, 30(8), 1017-1027. <https://doi.org/10.1080/10498850.2021.1963377>
- Itskovich, Y., Meikle, M. C., Cannon, R. D., Farella, M., Coates, D. E., & Milne, T. J. (2021). Differential behaviour and gene expression in 3D cultures of femoral- and calvarial-derived human osteoblasts under a cyclic compressive mechanical load. *European Journal of Oral Sciences*, 129, e12818. <https://doi.org/10.1111/eos.12818>
- James, J. E., Lamping, E., Santhanam, J., & Cannon, R. D. (2021). PDR transporter ABC1 is involved in the innate azole resistance of the human fungal pathogen *Fusarium keratoplaticum*. *Frontiers in Microbiology*, 12, 673206. <https://doi.org/10.3389/fmicb.2021.673206>
- Jamieson, L., Kearns, C., Ankeny, R., Hedges, J., & Thomson, W. M. (2021). Neoliberalism and Indigenous oral health inequalities: A global perspective. *Community Dental Health*, 39(2), 44-47. [https://doi.org/10.1922/CDH\\_00159Jamieson04](https://doi.org/10.1922/CDH_00159Jamieson04)
- Jayash, S. N., Cooper, P. R., Shelton, R. M., Kuehne, S. A., & Poologasundarampillai, G. (2021). Novel chitosan-silica hybrid hydrogels for cell encapsulation and drug delivery. *International Journal of Molecular Sciences*, 22, 12267. <https://doi.org/10.3390/ijms222212267>
- Jum'ah, A. A., Elsalem, L., Loch, C., Schwass, D., & Brunton, P. A. (2021). Perception of health and educational risks among dental students and educators in the era of COVID-19. *European Journal of Dental Education*, 25, 506-515. <https://doi.org/10.1111/eje.12626>
- Lacey, J. K., Thomson, W. M., Crampton, P., & Willing, E. (2021). Working towards Māori oral health equity: Why te Tiriti o Waitangi needs to underpin the oral health system, using evidence from the New Zealand Oral Health Survey. *New Zealand Dental Journal*, 117(3), 105-110.
- Lam, P. P. Y., Sardana, D., Luo, W., Ekambaram, M., Lee, G. H. M., Lo, E. C. M., & Yiu, C. K. Y. (2021). Glass ionomer sealant versus fluoride varnish application to prevent occlusal caries in primary second molars among preschool children: A randomized controlled trial. *Caries Research*, 55, 322-332. <https://doi.org/10.1159/000517390>
- Landi, F., Alfieri, F., Towle, I., Profico, A., & Veneziano, A. (2021). Fluctuating asymmetry and stress in *Macaca fuscata*: Does captivity affect morphology? *Applied Sciences*, 11, 7879. <https://doi.org/10.3390/app11177879>
- Leask, M., Carleton, C., Leeke, B., Newman, T., Antoun, J., Farella, M., & Horsfield, J. (2021). Ribocaine rescues auranofin-induced craniofacial defects in zebrafish. *Antioxidants*, 10, 1964. <https://doi.org/10.3390/antiox10121964>
- Lee, Y.-L., Li, K. C., Yiu, C. K. Y., Boyd, D. H., Waddell, J. N., & Ekambaram, M. (2021). Bonding universal dental adhesive to developmentally hypomineralised enamel. *Journal of Adhesive Dentistry*, 23(6), 513-525. <https://doi.org/10.3290/jad.b2288247>
- Li, G. H., Chen, S., Grymak, A., Waddell, J. N., Kim, J. J., & Choi, J. J. E. (2021). Fibre-reinforced and repaired PMMA denture base resin: Effect of placement on the flexural strength and load-bearing capacity. *Journal of the Mechanical Behavior of Biomedical Materials*, 124, 104828. <https://doi.org/10.1016/j.jmbbm.2021.104828>



- Li, F., Egea, P. F., Vecchio, A. J., Asial, I., Gupta, M., Paulino, J., ... Monk, B. C., & Stroud, R. M. (2021). Highlighting membrane protein structure and function: A celebration of the Protein Data Bank. *Journal of Biological Chemistry*, 296, 100557. <https://doi.org/10.1016/j.jbc.2021.100557>
- Li, H., Mei, L., Yang, Y., Zhao, X., & Li, Y. (2021). Distalisation of the dental arches using clear aligners and miniscrews. *Australasian Orthodontic Journal*, 37(1), 128-138. <https://doi.org/10.21307/aoj-2021-014>
- Li, E. G., Waddell, J. N., & Choi, J. J. E. (2021). Wear resistance of bulk-fill dental resins cured by different light-curing settings. *Biotribology*, 28, 100197. <https://doi.org/10.1016/j.biotri.2021.100197>
- Lin, W., Farella, M., Antoun, J. S., Topless, R. K., Merriman, T. R., & Michelotti, A. (2021). Factors associated with orthodontic pain. *Journal of Oral Rehabilitation*, 48, 1135-1143. <https://doi.org/10.1111/joor.13227>
- Lin, S., Huang, L., Li, J., Wen, J., Mei, L., Xu, H., ... Li, H. (2021). Assessment of preparation time and 1-year Invisalign aligner attachment survival using flowable and packable composites: A split-mouth clinical study. *Angle Orthodontist*, 91(5), 583-589. <https://doi.org/10.2319/063020-598.1>
- Loch, C., Beckett, D., Kawe-Small, T., Cannon, R. D., Foster Page, L. A., Te Morenga, L., & Smith, L. A. (2021). Sugar in your diet: Kino te pai! An evaluation of oral health science outreach and community impact. *International Journal of Health Promotion & Education*. Advance online publication. <https://doi.org/10.1080/14635240.2021.2004439>
- Loch, C., Jansen van Vuuren, L., Duncan, W. J., Boyd, D. H., & Foster Page, L. A. (2021). Ultrastructure and properties of primary carious molars treated using the Hall Technique. *International Journal of Paediatric Dentistry*, 31(3), 290-298. <https://doi.org/10.1111/ipd.12681>
- Loch, C., Kuan, I. B. J., Elsalem, L., Schwass, D., Brunton, P. A., & Jum'ah, A. A. (2021). COVID-19 and dental clinical practice: Students and clinical staff perceptions of health risks and educational impact. *Journal of Dental Education*, 85, 44-52. <https://doi.org/10.1002/jdd.12402>
- Lopes, F., Oliveira, L. R., Kessler, A., Beux, Y., Crespo, E., Cárdenas-Alayza, S., ... Loch, C., Robertson, B. C., ... Bonatto, S. L. (2021). Phylogenomic discordance in the eared seals is best explained by incomplete lineage sorting following explosive radiation in the southern hemisphere. *Systematic Biology*, 70(4), 786-802. <https://doi.org/10.1093/sysbio/syaa099>
- Luo, H., Wu, H., Tan, X., Ye, Y., Huang, L., Dai, H., & Mei, L. (2021). Osteopenic effects of high-fat diet-induced obesity on mechanically induced alveolar bone remodeling. *Oral Diseases*, 27, 1243-1256. <https://doi.org/10.1111/odi.13651>
- MacEntee, M. I., Brondani, M., Avivi-Arber, L., Bartlett, D., Donnelly, L., Duyck, J., ... Thomson, W. M., ... Wyatt, C. (2021). Clinical Oral Disorders in Adults Screening Protocol (CODA-SP) from the 2019 Vancouver IADR Consensus Symposium. *Gerodontology*, 38, 5-16. <https://doi.org/10.1111/ger.12496>
- Madani, G., Lamping, E., & Cannon, R. D. (2021). Engineering a cysteine-deficient functional *Candida albicans* Cdr1 molecule reveals a conserved region at the cytosolic apex of ABCG transporters important for correct folding and trafficking of Cdr1. *mSphere*, 6(1), e01318-20. <https://doi.org/10.1128/mSphere.01318-20>
- Madani, G., Lamping, E., Lee, H. J., Niimi, M., Mitra, A. K., & Cannon, R. D. (2021). Small-scale plasma membrane preparation for the analysis of *Candida albicans* Cdr1-mGFPHis. *Journal of Visualized Experiments*, 172, e62592. <https://doi.org/10.3791/62592>
- McFarlane, G., Guatelli-Steinberg, D., Loch, C., White, S., Bayle, P., Floyd, B., ... Mahoney, P. (2021). An inconstant biorhythm: The changing pace of Retzius periodicity in human permanent teeth. *American Journal of Physical Anthropology*, 175, 172-186. <https://doi.org/10.1002/ajpa.24206>
- McFarlane, G., Loch, C., Guatelli-Steinberg, D., Bayle, P., Le Luyer, M., Sabel, N., ... White, S., ... Mahoney, P. (2021). Enamel daily secretion rates of deciduous molars from a global sample of children. *Archives of Oral Biology*, 132, 105290. <https://doi.org/10.1016/j.archoralbio.2021.105290>
- McKeage, J. W., Loch, C., Zwirner, J., Hammer, N., White, D. E., Ruddy, B. P., Brunton, P. A., & Taberner, A. J. (2021). Controllable jet injection of dental local anaesthetic. *IEEE Journal of Translational Engineering in Health & Medicine*, 9, 2300108. <https://doi.org/10.1109/JTEHM.2021.3090748>
- Miao, W., Zhou, D., Li, C., Chen, L., Guan, M., Peng, Y., & Mei, L. (2021). Dental developmental stage affects the treatment outcome of maxillary protraction in skeletal class iii children: A systematic review and meta-analysis. *Australasian Orthodontic Journal*, 37(1), 37-49. <https://doi.org/10.21307/aoj-2021-004>
- Mohamad, S. A., Milward, M. R., Kuehne, S. A., Hadis, M. A., Palin, W. M., & Cooper, P. R. (2021). Potential for direct application of blue light for photo-disinfection of dentine. *Journal of Photochemistry & Photobiology B*, 215, 112123. <https://doi.org/10.1016/j.jphotobiol.2021.112123>

- Naung, N. Y., Duncan, W. J., De Silva, R. K., & Coates, D. E. (2021). HGF/MET in osteogenic differentiation of primary human palatal periosteum-derived mesenchymal stem cells. *Journal of Oral Science*, 63(4), 341-346. <https://doi.org/10.2334/josnusd.21-0164>
- Ngah, N. A., Dias, G. J., Tong, D. C., Mohd Noor, S. N. F., Ratnayake, J., Cooper, P. R., & Hussaini, H. M. (2021). Lyophilised platelet-rich fibrin: Physical and biological characterisation. *Molecules*, 26(23), 7131. <https://doi.org/10.3390/molecules26237131>
- Nguyen, H. T., Zhang, R., Inokawa, N., Oura, T., Chen, X., Iwatani, S., ... Holmes, A. R., Cannon, R. D., & Kajiwar, S. (2021). Candida albicans Bgl2p, Ecm33p, and Als1p proteins are involved in adhesion to saliva-coated hydroxyapatite. *Journal of Oral Microbiology*, 13(1), 1879497. <https://doi.org/10.1080/20002297.2021.1879497>
- Ni Riordain, R., Glick, M., Mashhadani, S. S. A. A., Aravamudan, K., Barrow, J., Cole, D., ... Thomson, W. M., ... Williams, D. M. (2021). Developing a standard set of patient-centred outcomes for adult oral health: An international, cross-disciplinary consensus. *International Dental Journal*, 71(1), 40-52. <https://doi.org/10.1111/idj.12604>
- Niu, J. Y., Yin, I. X., Wu, W. K. K., Li, Q.-L., Mei, M. L., & Chu, C. H. (2021). Remineralising dentine caries using an artificial antimicrobial peptide: An in vitro study. *Journal of Dentistry*, 111, 103729. <https://doi.org/10.1016/j.jdent.2021.103729>
- Niu, J. Y., Yin, I. X., Wu, W. K. K., Li, Q.-L., Mei, M. L., & Chu, C. H. (2021). A novel dual-action antimicrobial peptide for caries management. *Journal of Dentistry*, 111, 103729. <https://doi.org/10.1016/j.jdent.2021.103729>
- Paduano, F., Aiello, E., Cooper, P. R., Marrelli, B., Makeeva, I., Islam, M., ... Tatullo, M. (2021). A dedifferentiation strategy to enhance the osteogenic potential of dental derived stem cells. *Frontiers in Cell & Developmental Biology*, 9, 668558. <https://doi.org/10.3389/fcell.2021.668558>
- Paras, A., Ma, S., Waddell, J. N., & Choi, J. J. E. (2021). Real-time in vitro measurement of denture-mucosa pressure distribution in a typical edentulous patient with and without implants: Development of a methodology. *Journal of the Mechanical Behavior of Biomedical Materials*. <https://doi.org/10.1016/j.jmbbm.2021.104531>
- Porter, G. C., Duncan, W. J., Abdelmoneim, D., Easingwood, R. A., & Coates, D. E. (2021). Endocytosed silver nanoparticles degrade in lysosomes to form secondary nanoparticle structures during expression of autophagy genes in osteogenic cells. *Nanomedicine*, 33, 102355. <https://doi.org/10.1016/j.nano.2020.102355>
- Porter, G. C., Safii, S. H., Medlicott, N. J., Duncan, W. J., Tompkins, G. R., & Coates, D. E. (2021). Formulation of a semisolid emulsion containing Leptospermum scoparium essential oil and evaluation of in vitro antimicrobial and antibiofilm efficacy. *Planta Medica*, 87, 253-266. <https://doi.org/10.1055/a-1330-8765>
- Prasad, S., Farella, M., Paulin, M., Yao, S., Zhu, Y., & Jansen van Vuuren, L. (2021). Effect of electrode characteristics on electromyographic activity of the masseter muscle. *Journal of Electromyography & Kinesiology*, 56, 102492. <https://doi.org/10.1016/j.jelekin.2020.102492>
- Prasad, S., Ramanan, D., Bennani, H., Paulin, M., Cannon, R. D., Palla, S., & Farella, M. (2021). Associations among masticatory muscle activity, physical activity and self-reported oral behaviours in adult women. *Clinical Oral Investigations*, 25, 5049-5059. <https://doi.org/10.1007/s00784-021-03816-9>
- Ramanan, D., Palla, S., Bennani, H., Polonowita, A., & Farella, M. (2021). Oral behaviours and wake-time masseter activity in patients with masticatory muscle pain. *Journal of Oral Rehabilitation*, 48, 979-988. <https://doi.org/10.1111/joor.13219>
- Sakane, K. K., Bhattacharjee, T., Fagundes, J., Marcolino, L. M. C., Ferreira, I., Pinto, J. G., & Ferreira-Strixino, J. (2021). Biochemical changes in Leishmania braziliensis after photodynamic therapy with methylene blue assessed by the Fourier transform infrared spectroscopy. *Lasers in Medical Science*, 36, 821-827. <https://doi.org/10.1007/s10103-020-03110-2>
- Seo, B., Hussaini, H., & Rich, A. M. (2021). The effect of the COVID-19 pandemic lockdown on the oral and maxillofacial pathology diagnostic services in New Zealand. *New Zealand Dental Journal*, 117(2), 67-72.
- Serrage, H. J., Cooper, P. R., Palin, W. M., Horstman, P., Hadis, M., & Milward, M. R. (2021). Photobiomodulation of oral fibroblasts stimulated with periodontal pathogens. *Lasers in Medical Science*, 36, 1957-1969. <https://doi.org/10.1007/s10103-021-03331-z>
- Sese, P., Thomson, W. M., Tong, D., & Sopoaga, T. (2021). Self-reported oral health, dental anxiety and use of services in Pacific tertiary students. *New Zealand Dental Journal*, 117(4), 211-217.
- Sharma, A., Waddell, J. N., Li, K. C., Sharma, L. A., Prior, D. J., & Duncan, W. J. (2021). Is titanium-zirconium alloy a better alternative to pure titanium for oral implant? Composition, mechanical properties, and microstructure analysis. *Saudi Dental Journal*, 33, 546-553. <https://doi.org/10.1016/j.sdentj.2020.08.009>

- Singh, R. G., Li, K. C., Lyons, K. M., & Waddell, J. N. (2021). Effect of two brands of glaze material on the flexural strength and probability of failure of high translucent monolithic zirconia. *Materials*, 14(22), 7022. <https://doi.org/10.3390/ma14227022>
- Smith, M., Stroud, C., Low, M., Gibson, C., Ferguson, C. A., & Broadbent, J. (2021). Non-traumatic dental presentations at emergency departments in New Zealand. *New Zealand Medical Journal*, 134(1544), 99-112. Retrieved from <https://www.nzma.org.nz/journal>.
- Stormon, N., Beckett, D., Gardner, S., Keshoor, S., Smart, K., Wallace, L., ... Eley, D. (2021). Empathetic, persistent and female: A snapshot of Oral Health Therapy Students in Australia and New Zealand. *European Journal of Dental Education*, 26, 206-215. <https://doi.org/10.1111/eje.12689>
- Sukumaran, I., Taylor, S., & Thomson, W. M. (2021). The prevalence and impact of dental anxiety among adult New Zealanders. *International Dental Journal*, 71, 122-126. <https://doi.org/10.1111/idj.12613>
- Tabassum, N., Ahmed, S., & Ali, M. A. (2021). Chitooligosaccharides and their structural-functional effect on hydrogels: A review. *Carbohydrate Polymers*. <https://doi.org/10.1016/j.carbpol.2021.117882>
- Thomson, W. M., & Barak, Y. (2021). Tooth loss and dementia: A critical examination. *Journal of Dental Research*, 100(3), 226-231. <https://doi.org/10.1177/0022034520957233>
- Thomson, W. M., Smith, M. B., Ferguson, C. M., & Moses, G. (2021). The challenge of medication-induced dry mouth in residential aged care. *Pharmacy*, 9(4), 162. <https://doi.org/10.3390/pharmacy9040162>
- Thornley, S., Bach, K., Bird, A., Farrar, R., Bronte, S., Turton, B., ... Grant, C. (2021). What factors are associated with early childhood dental caries? A longitudinal study of the Growing Up in New Zealand cohort. *International Journal of Paediatric Dentistry*, 31, 351-360. <https://doi.org/10.1111/ipd.12686>
- Towle, I., Irish, J. D., De Groote, I., Fernée, C., & Loch, C. (2021). Dental caries in South African fossil hominins. *South African Journal of Science*, 117(3/4), 8705. <https://doi.org/10.17159/sajs.2021/8705>
- Towle, I., Irish, J. D., & Loch, C. (2021). *Paranthropus robustus* tooth chipping patterns do not support regular hard food mastication [Short communications]. *Journal of Human Evolution*, 158, 103044. <https://doi.org/10.1016/j.jhevol.2021.103044>
- Towle, I., & Loch, C. (2021). Tooth chipping prevalence and patterns in extant primates. *American Journal of Physical Anthropology*, 175, 292-299. <https://doi.org/10.1002/ajpa.24232>
- Tykhonova, L. Y., Dias, M., Zhou, L. D., Richardson, C., Waddell, J. N., & Choi, J. J. E. (2021). The efficacy of a novel temporary crown system marginal seal and structural durability in terms of cyclic loading: A pilot study. *Dental Oral Biology & Craniofacial Research*, 3(1), 2-7. <https://doi.org/10.31487/j.DOBCE.2020.01.01>
- van Kuijk, M., Smith, M. B., Ferguson, C. A., Kerse, N. M., Teh, R., Gribben, B., & Thomson, W. M. (2021). Dentition and nutritional status of aged New Zealanders living in aged residential care. *Oral Diseases*, 27, 370-377. <https://doi.org/10.1111/odi.13536>
- Vieira, C. A. G. A., Pupin, B., Bhattacharjee, T. T., & Sakane, K. K. (2021). Infrared spectroscopy based study of biochemical changes in saliva during maximal progressive test in athletes. *Analytical Sciences*, 37, 1157-1163. <https://doi.org/10.2116/analsci.20P395>
- Wang, Y., Bai, S., Cheng, Q., Zeng, Y., Xu, X., & Guan, G. (2021). Naringenin promotes SDF-1/CXCR4 signaling pathway in BMSCs osteogenic differentiation. *Folia Histochemica et Cytobiologica*, 59(1), 66-73. <https://doi.org/10.5603/FHC.a2021.0008>
- Wang, W. J., Grymak, A., Waddell, J. N., & Choi, J. J. E. (2021). The effect of light curing intensity on bulk-fill composite resins: Heat generation and chemomechanical properties. *Biomaterial Investigations in Dentistry*, 8(1), 137-151. <https://doi.org/10.1080/26415275.2021.1979981>
- Wang, C., Lucas, R., Milward, M., & Cooper, P. R. (2021). Particle size effects on abrasion, surface polishing and stain removal efficacy in a tooth model system. *Biotribology*, 28, 100196. <https://doi.org/10.1016/j.biotri.2021.100196>
- Wertz, J., Caspi, A., Ambler, A., Broadbent, J., Hancox, R. J., Harrington, H., Hogan, S., ... Leung, J. H., Poulton, R., ... Ramrakha, S., ... Thorne, P. R., Wilson, G. A., & Moffitt, T. E. (2021). Association of history of psychopathology with accelerated aging at midlife. *JAMA Psychiatry*, 78(5), 530-539. <https://doi.org/10.1001/jamapsychiatry.2020.4626>
- Wimardhani, Y. S., Rahmayanti, F., Maharani, D. A., Mayanti, W., & Thomson, W. M. (2021). The validity and reliability of the Indonesian version of the Summated Xerostomia Inventory. *Gerodontology*, 38, 82-86. <https://doi.org/10.1111/ger.12494>



Won, J., Guan, G., Mei, L., Ma, T., Lai, Y., Zafar, S., Mei, M. L., & Thomson, W. M. (2021). A multicenter study of dental curricula in Asia/Pacific nations: The views and experiences of final-year dental students. *Journal of Dental Education*, 85, 660-668. <https://doi.org/10.1002/jdd.12515>

Wu, T. Y., Sun, G., De Silva, H., & Thomson, W. M. (2021). New Zealand general dental practitioners' perspectives on medication related to osteonecrosis of the jaw. *New Zealand Dental Journal*, 117(4), 202-210.

Yong, D., & Cathro, P. (2021). Conservative pulp therapy in the management of reversible and irreversible pulpitis. *Australian Dental Journal*, 66(Suppl. 1), S4-S14. <https://doi.org/10.1111/adj.12841>

Yoshida, M., Turner, P. R., Ali, A., & Cabral, J. D. (2021). Three-dimensional melt-electrowritten polycaprolactone/chitosan scaffolds enhance mesenchymal stem cell behavior. *ACS Applied Bio Materials*, 4, 1319-1329. <https://doi.org/10.1021/acsbm.0c01213>

Youhanna, K. M. Y., Adam, L., Monk, B. C., & Loch, C. (2021). Dentistry students' experiences, engagement and perception of biochemistry within the dental curriculum and beyond. *European Journal of Dental Education*, 25, 318-324. <https://doi.org/10.1111/eje.12607>

Zhang, L., He, H., Zhang, M., Wu, Y., Xu, X., Yang, M., & Mei, L. (2021). Assessing the effect and related mechanism of naringenin on the proliferation, osteogenic differentiation and endothelial differentiation of human periodontal ligament stem cells. *Biochemical & Biophysical Research Communications*, 534, 337-342. <https://doi.org/10.1016/j.bbrc.2020.11.081>

Zhang, T., Jiang, W.-R., Xia, Y.-Y., Mansell, T., Saffery, R., Cannon, R. D., ... Baker, P. N. (2021). Complex patterns of circulating fatty acid levels in gestational diabetes mellitus subclasses across pregnancy. *Clinical Nutrition*, 40, 4140-4148. <https://doi.org/10.1016/j.clnu.2021.01.046>

Zhang, Y., Qi, Y., Lo, E. C. M., McGrath, C., Mei, M. L., & Dai, R. (2021). Using next-generation sequencing to detect oral microbiome change following periodontal interventions: A systematic review. *Oral Diseases*, 21, 1073-1089. <https://doi.org/10.1111/odi.13405>

Zhang, J., Zhao, I. S., Yu, O. Y., Li, Q., Mei, M. L., Zhang, C., & Chung, C. H. (2021). Layer-by-layer self-assembly polyelectrolytes loaded with cyclic adenosine monophosphate enhances the osteo/odontogenic differentiation of stem cells from apical papilla. *Journal of Biomedical Materials Research Part A*, 109, 207-218. <https://doi.org/10.1002/jbm.a.37017>

Zwirner, J., Safavi, S., Scholze, M., Li, K. C., Waddell, J. N., Busse, B., ... Hammer, N. (2021). Topographical mapping of the mechanical characteristics of the human neurocranium considering the role of individual layers. *Scientific Reports*, 11(1), 3721. <https://doi.org/10.1038/s41598-020-80548-y>

## Journal - Research Other

Cooper, P. R., Moffat, S. M., & Thomson, W. M. (2022). Te Kaupeka Pūniho: New Zealand's new dental school. *British Dental Journal*, 233(2), 154-158. <https://doi.org/10.1038/s41415-022-4450-0>

Jiang, Y., Tang, T., Mei, L., & Li, H. (2022). COVID-19 affected patients' utilization of dental care service [Short communication]. *Oral Diseases*, 28(Suppl. 1), 916-919. <https://doi.org/10.1111/odi.13568>

Towle, I., Constantino, P. J., Borths, M. R., & Loch, C. (2022). Tooth chipping patterns in Archaeolemur provide insight into diet and behavior [Brief communication]. *American Journal of Biological Anthropology*. Advance online publication. <https://doi.org/10.1002/ajpa.24674>

Towle, I., MacIntosh, A. J. J., Hirata, K., Kubo, M. O., & Loch, C. (2022). Atypical tooth wear found in fossil hominins also present in a Japanese macaque population [Brief communication]. *American Journal of Biological Anthropology*. Advance online publication. <https://doi.org/10.1002/ajpa.24500>

Allen, L. L., Heng, N. C. K., & Tompkins, G. R. (2021). *Streptococcus salivarius* isolates of varying acid tolerance exhibit F1F0-ATPase conservation [Brief report]. *Caries Research*, 55, 288-291. <https://doi.org/10.1159/000516175>

Moffat, S., Carrington, S., & Morgan, M. (2021). Part 1: A brief history of New Zealand's School Dental Service. *NZDA News*, 204, 25-36.

Moffat, S., Carrington, S., & Morgan, M. (2021). Part 2: The oral health professions in the 21st Century. *NZDA News*, 204, 37-43.

Snoddy, A. M. E., Miskiewicz, J. J., Loch, C., Tromp, M., & Buckley, H. R. (2021). An image analysis protocol for the quantification of interglobular dentine in anthropological tooth sections [Technical note]. *American Journal of Physical Anthropology*, 174, 144-148. <https://doi.org/10.1002/ajpa.24143>

Thomson, W. M., Ferguson, C. A., Janssens, B. E., Kerse, N. M., Ting, G. S., & Smith, M. B. (2021). Xerostomia and polypharmacy among dependent older New Zealanders: A national survey [Short report]. *Age & Ageing*, 50, 248-251. <https://doi.org/10.1093/ageing/afaa099>

Towle, I., Loch, C., Irish, J. D., Veneziano, A., & Ito, T. (2021). Chipping and wear patterns in extant primate and fossil hominin molars: 'Functional' cusps are associated with extensive wear but low levels of fracture [Short communication]. *Journal of Human Evolution*, 151, 102923. <https://doi.org/10.1016/j.jhevol.2020.102923>

## Case Study

Alsabeeha, N. H. M., Ma, S., & Payne, A. G. T. (2022). Mandibular 3-implant overdenture: A clinical report of a novel design. *Gerodontology*. Advance online publication. <https://doi.org/10.1111/ger.12615>.

Bridgman, J. B., Chancellor, A. M., & Crisp, S. (2022). Consider a new diagnosis of epilepsy as a cause of tongue ulceration. *New Zealand Dental Journal*, 118(3), 110-112.

Dong, C., Xu, Y., Zhao, H., Duan, D., Mei, L., Zhao, Z., & Tan, L. (2022). Light force and multidisciplinary approach for large scale retraction and intrusion of maxillary incisors with periodontal supporting tissue loss caused by iatrogenic damage from elastic bands. *American Journal of Orthodontics & Dentofacial Orthopedics*, 2, 167-179. <https://doi.org/10.1016/j.xaor.2022.01.005>.

Goh, R., Tawse-Smith, A., Reid, I. P., Hussaini, H. M., & Seo, B. (2022). Fibrous epulis with ossification: A case report and review of the literature. *Brazilian Journal of Periodontology*, 31(3), 73-81. <https://doi.org/10.14436/0103-9393.31.3.073-081.oar>.

Wang, R., Mei, L., Hwang, S., & Li, Y. (2022). Traction of impacted and stacked maxillary anterior teeth with precise biomechanics followed by torque control using gate spring. *American Journal of Orthodontics & Dentofacial Orthopedics*. Advance online publication. <https://doi.org/10.1016/j.ajodo.2021.04.036>.

Narsinh, P., & Lin, Y. (2021). Idiopathic myositis ossificans of the lateral pterygoid muscle in the paediatric patient: A case report. *Advances in Oral & Maxillofacial Surgery*, 1, 100002. <https://doi.org/10.1016/j.adoms.2020.100002>.

Wilson, B., Coghlan, P., & Schuurman, N. (2021). Post-ablative orbital reconstruction: A case report. *New Zealand Dental Journal*, 117(2), 81-85.

Yu, S., Narsinh, P., & Tong, D. (2021). 3 case reports of wooden periorbital foreign bodies at a single centre tertiary hospital. *Advances in Oral & Maxillofacial Surgery*, 3, 100101. <https://doi.org/10.1016/j.adoms.2021.100101>.

## Editorial

Broadbent, J. M., & Osborne, A. J. (2022). Longitudinal research in Aotearoa New Zealand. *Journal of the Royal Society of New Zealand*, 52(3), 213-215. <https://doi.org/10.1080/03036758.2022.2090413>.

Melo, M. A., Mei, M. L., Li, K. C., & Hamama, H. H. (2022). Editorial: The use of bioactive materials in caries management. *Frontiers in Oral Health*, 3, 832285. <https://doi.org/10.3389/froh.2022.832285>.

Satur, J., & Carrington, S. (2022). Cultural safety in Aotearoa New Zealand and Australia: Why and how for oral health? *Australian & New Zealand Journal of Dental & Oral Health Therapy*, 10(2), 1, 4-7.

Broadbent, J., & Chandler, N. (2021). Guest editorial: A thank you to our reviewers. *New Zealand Dental Journal*, 117(2), 52-53.

Chandler, N. (2021). Grand opening of redeveloped Dental School. *New Zealand Dental Journal*, 117(1), 3.

Moffat, S. M., & Ahmadl, R. M. (2021). Achievements and challenges: Providing 100 years of oral health services for New Zealand children. *Australian & New Zealand Journal of Dental & Oral Health Therapy*, 9(1), 1, 4-7.

## Professional Guidelines

Lee, C., Olson, H., & Anakin, M. (2022). Advice for constructing a productive supervisory relationship in education research. *Medical Science Educator*. Advance online publication. <https://doi.org/10.1007/s40670-022-01688-6>.

Ross, E., & Wilson, B. J. (2022). Securing the oral endotracheal tube in patients with facial burns: A critical care clinician technique. *Annals of Burns & Fire Disasters*, 35(4), 300-305.

Torkan, S., Firth, F., Fleming, P. S., Kravitz, N. D., Farella, M., & Huang, G. J. (2021). Retention: Taking a more active role [Clinical]. *British Dental Journal*, 230(11), 731-738. <https://doi.org/10.1038/s41415-021-2952-9>.

## Protocol/Methodology

Lord, S., Teh, R., Gibson, R., Smith, M., Wrapson, W., Thomson, M., ... McBain, L., ... Abey-Nesbit, R., and on behalf of the AWESSOM Project Team, including Jamieson, H. (2022). Optimising function and well-being in older adults: Protocol for an integrated research programme in Aotearoa/New Zealand. *BMC Geriatrics*, 22, 215. <https://doi.org/10.1186/s12877-022-02845-7>

Zhao, M.-L., Zhang, F.-J., Jiang, W.-R., Xia, Y., Chen, C., Zhang, T., ... Mei, P., ... Thomson, M., ... Cannon, R. D., ... Ji, P. (2022). Investigating the impact of oral health on pregnancy and offspring outcomes: Protocol for the Lifetime Impact of ORal heAlth (LIORA) cohort study. *BMJ Open*, 12(11), e066204. <https://doi.org/10.1136/bmjopen-2022-066204>.

Sadr, A., Rossi-Fedele, G., Love, R. M., George, R., Parashos, P., Wu, M. C.-Y., Friedlander, L., ... Abbott, P. V. (2021). Revised guidelines for the endodontic education of dentistry students in Australia and New Zealand (FEBRUARY 2021). *Australian Endodontic Journal*, 47, 327-331. <https://doi.org/10.1111/aej.12501>.

Taylor, R. W., Conlon, C. A., Beck, K. L., von Hurst, P. R., Te Morenga, L. A., Daniels, L., Haszard, J. J., Meldrum, A. M., McLean, N. H., Cox, A. M., Tukuafu, L., Casale, M., Brown, K. J., Jones, E. A., Katiforis, I., Rowan, M., McArthur, J., Fleming, E. A., Wheeler, B. J., Houghton, L. A., Diana, A., & Heath, A.-L. M. (2021). Nutritional implications of baby-led weaning and baby food pouches as novel methods of infant feeding: Protocol for an observational study. *JMIR Research Protocols*, 10(4), e29048. <https://doi.org/10.2196/29048>.

## Review

Ahmed, M. K., Bhowmik, S., Giteru, S. G., Zilani, M. N. H., Adadi, P., Islam, S. S., ... Ahmed, F., ... Bekhit, A. E.-D. A., ... Wong, J. (2022). An update of lectins from marine organisms: Characterization, extraction methodology, and potential biofunctional applications. *Marine Drugs*, 20, 430. <https://doi.org/10.3390/md20070430>.

Alsabeeha, N. H. M., Atieh, M. A., & Balakrishnan, M. S. (2022). Older adults' satisfaction with telemedicine during the COVID-19 pandemic: A systematic review. *Telemedicine Journal & e-Health*. Advance online publication. <https://doi.org/10.1089/tmj.2022.0045>.

Arora, S., Cooper, P. R., Ratnayake, J. T., Friedlander, L. T., Rizwan, S. B., Seo, B., & Hussaini, H. M. (2022). A critical review of in vitro research methodologies used to study mineralization in human dental pulp cell cultures. *International Endodontic Journal*, 55(Suppl. 1), 3-13. <https://doi.org/10.1111/iej.13684>.

Atieh, M. A., Almatrooshi, A., Shah, M., Hannawi, H., Tawse-Smith, A., & Alsabeeha, N. H. M. (2022). Airflow for initial nonsurgical treatment of peri-implantitis: A systematic review and meta-analysis. *Clinical Implant Dentistry & Related Research*. Advance online publication. <https://doi.org/10.1111/cid.13072>.

Badarneh, A., Choi, J. J. E., Lyons, K., Waddell, J. N., & Li, K. C. (2022). Wear behaviour of monolithic zirconia against human enamel: A literature review. *Biotribology*, 100224. Advance online publication. <https://doi.org/10.1016/j.biotri.2022.100224>.

Bakri, N. N., Smith, M. B., Broadbent, J. M., & Thomson, W. M. (2022). Oral health promotion activities in the workplace: A scoping review. *Health Promotion International*. Advance online publication. <https://doi.org/10.1093/heapro/daac039>.

Cannon, R. D. (2022). Oral fungal infections: Past, present, and future. *Frontiers in Oral Health*, 3, 838639. <https://doi.org/10.3389/froh.2022.838639>.

Grymak, A., Aarts, J. M., Ma, S., Waddell, J. N., & Choi, J. J. E. (2022). Wear behavior of occlusal splint materials manufactured by various methods: A systematic review. *Journal of Prosthetics*, 31, 472-487. <https://doi.org/10.1111/jopr.13432>.

Guan, G., Rich, A. M., Polonowita, A., & Mei, L. (2022). Review of taste and taste disturbance in COVID-19 patients. *New Zealand Medical Journal*, 135(1549), 81-91. Retrieved from <https://www.nzma.org.nz/journal>.

Khashashneh, M., Ratnayake, J., Choi, J. J. E., Mei, L., Lyons, K., & Brunton, P. A. (2022). The effectiveness of dental bleaching during orthodontic treatment with clear aligners: A systematic review. *Applied Sciences*, 12(21), 11274. <https://doi.org/10.3390/app122111274>.

Mohammed, H., Daniel, B. K., Skilbeck, M., Kumar, Jr, R., Halberstadt, J. B., & Farella, M. (2022). A qualitative meta-synthesis of research into patients' past experiences and perceptions of orthodontic treatment outcomes. *European Journal of Orthodontics*, 44, 369-376. <https://doi.org/10.1093/ejo/cjac008>.

Mudliar, V. L., Tieh, M. T., Aarts, J. M., Paras, A., & Choi, J. J. E. (2022). Wear of modern denture teeth: A systematic review. *Oral*, 2, 95-111. <https://doi.org/10.3390/oral2010011>.

Nichols, G. A. L., Broadbent, J. M., & Farella, M. (2022). Does malocclusion affect oral health-related quality of life? A review of the literature. *New Zealand Dental Journal*, 118(1), 27-39.

Nizami, M. Z. I., Yin, I. X., Lung, C. Y. K., Niu, J. Y., Mei, M. L., & Chu, C. H. (2022). In vitro studies of graphene for management of dental caries and periodontal disease: A concise review. *Pharmaceutics*, 14, 1997. <https://doi.org/10.3390/pharmaceutics14101997>.

Paras, A., Ma, S., Waddell, J. N., & Choi, J. J. E. (2022). Denture-mucosa pressure distribution and pressure-pain threshold in vivo, in vitro and in silico studies: A literature review. *Oral*, 2, 112-125. <https://doi.org/10.3390/oral2010012>.

- Priede, A., Lau, P., Darby, I., Morgan, M., & Mariño, R. (2022). Referral compliance following a diabetes screening in a dental setting: A scoping review. *Healthcare*, 10(10). <https://doi.org/10.3390/healthcare10102020>.
- Zhang, O. L., Niu, J. Y., Yin, I. X., Yu, O. Y., Mei, M. L., & Chu, C. H. (2022). Growing global research interest in antimicrobial peptides for caries management: A bibliometric analysis. *Journal of Functional Biomaterials*, 13, 210. <https://doi.org/10.3390/jfb13040210>.
- Arora, S., Cooper, P. R., Friedlander, L. T., Rizwan, S., Seo, B., Rich, A. M., & Hussaini, H. M. (2021). Potential application of immunotherapy for modulation of pulp inflammation: Opportunities for vital pulp treatment. *International Endodontic Journal*, 54, 1263-1274. <https://doi.org/10.1111/iej.13524>.
- Banerjee, A., Pata, J., Sharma, S., Monk, B. C., Falson, P., & Prasad, R. (2021). Directed mutational strategies reveal drug binding and transport by the MDR transporters of *Candida albicans*. *Journal of Fungi*, 7(2), 68. <https://doi.org/10.3390/jof7020068>.
- Bennani, V., Chuang, Y.-S., Aarts, J. M., & Brunton, P. (2021). Evaluation of effectiveness and adverse effects of retraction cord vs retraction paste: A systematic review. *International Journal of Prosthodontics & Restorative Dentistry*, 11(4), 183-190. <https://doi.org/10.5005/jp-journals-10019-1344>.
- Chawhuaveang, D. D., Yu, O. Y., Yin, I. X., Lam, W. Y.-H., Mei, M. L., & Chu, C.-H. (2021). Acquired salivary pellicle and oral diseases: A literature review. *Journal of Dental Sciences*, 16, 523-529. <https://doi.org/10.1016/j.jds.2020.10.007>.
- Chen, L., Al-Bayatee, S., Khurshid, Z., Shavandi, A., Brunton, P., & Ratnayake, J. (2021). Hydroxyapatite in oral care products: A review. *Materials*, 14, 4865. <https://doi.org/10.3390/ma14174865>.
- Chua, H., Sardana, D., Turner, R., Ting, G., & Ekambaram, M. (2021). Effectiveness of oral health education methods on oral hygiene in children and adolescents with visual impairment: A systematic review. *International Journal of Paediatric Dentistry*, 31, 724-741. <https://doi.org/10.1111/ipd.12788>.
- Deng, X., Qasim, M., & Ali, A. (2021). Engineering and polymeric composition of drug-eluting suture: A review. *Journal of Biomedical Materials Research Part A*, 109, 2065-2081. <https://doi.org/10.1002/jbm.a.37194>.
- Dong, Z., & Coates, D. (2021). Bioactive molecular discovery using deer antlers as a model of mammalian regeneration. *Journal of Proteome Research*, 20(5), 2167-2181. <https://doi.org/10.1021/acs.jproteome.1c00003>.
- El Karim, I. A., Cooper, P. R., About, I., Tomson, P. L., Lundy, F. T., & Duncan, H. F. (2021). Deciphering reparative processes in the inflamed dental pulp. *Frontiers in Dental Medicine*, 2(8), 651219. <https://doi.org/10.3389/fdmed.2021.651219>.
- Jadhav, K. B., Nagraj, S. K., & Arora, S. (2021). miRNA for the assessment of lymph node metastasis in patients with oral squamous cell carcinoma: Systematic review and metanalysis. *Journal of Oral Pathology & Medicine*, 50, 345-352. <https://doi.org/10.1111/jop.13134>.
- Jiang, C. M., Duangthip, D., Auychai, P., Chiba, M., Folayan, M. O., Hamama, H. H. H., ... Lyons, K., ... Mei, M. L., Morgan, M., ... Lo, E. C. M. (2021). Changes in oral health policies and guidelines during the COVID-19 pandemic. *Frontiers in Oral Health*, 2, 668444. <https://doi.org/10.3389/froh.2021.668444>.
- Li, B., Guan, G., Mei, L., Jiao, K., & Li, H. (2021). Pathological mechanism of chondrocytes and the surrounding environment during osteoarthritis of temporomandibular joint. *Journal of Cellular & Molecular Medicine*, 25, 4902-4911. <https://doi.org/10.1111/jcmm.16514>.
- Lv, N., Sun, M., Polonowita, A., Mei, L., & Guan, G. (2021). Management of oral medicine emergencies during COVID-19: A study to develop practice guidelines. *Journal of Dental Sciences*, 16, 493-500. <https://doi.org/10.1016/j.jds.2020.07.016>.
- Mane, R. J., Choi, J. J. E., & Sharpe-Davidson, W. F. (2021). Tramadol as a local anaesthetic agent in dentistry: A systematic review of local and systemic adverse effects. *Saudi Dental Journal*, 33, 842-852. <https://doi.org/10.1016/j.sdentj.2021.09.015>.
- Mohamad, S. A., Milward, M. R., Hadis, M. A., Kuehne, S. A., & Cooper, P. R. (2021). Photobiomodulation of mineralisation in mesenchymal stem cells. *Photochemical & Photobiological Sciences*, 20, 699-714. <https://doi.org/10.1007/s43630-021-00047-5>.
- Monk, B. C., & Keniya, M. V. (2021). Roles for structural biology in the discovery of drugs and agrochemicals targeting sterol 14 $\alpha$ -demethylases. *Journal of Fungi*, 7(2), 67. <https://doi.org/10.3390/jof7020067>.
- Ngah, N. A., Ratnayake, J., Cooper, P. R., Dias, G. J., Tong, D. C., Mohd Noor, S. N. F., & Hussaini, H. M. (2021). Potential of lyophilized platelet concentrates for craniofacial tissue regenerative therapies. *Molecules*, 26, 517. <https://doi.org/10.3390/molecules26030517>.
- Ngo, D. Y. J., & Thomson, W. M. (2021). An update on the lived experience of dry mouth in Sjögren's syndrome patients. *Frontiers in Oral Health*, 2, 767568. <https://doi.org/10.3389/froh.2021.767568>.



Niu, J. Y., Yin, I. X., Mei, M. L., Wu, W. K. K., Li, Q.-L., & Chu, C. H. (2021). The multifaceted roles of antimicrobial peptides in oral diseases. *Molecular Oral Microbiology*, 36, 159-171. <https://doi.org/10.1111/omi.12333>.

Niu, J. Y., Yin, I. X., Wu, W. K. K., Li, Q.-L., Mei, M. L., & Chu, C. H. (2021). Antimicrobial peptides for the prevention and treatment of dental caries: A concise review. *Archives of Oral Biology*, 122, 105022. <https://doi.org/10.1016/j.archoralbio.2020.105022>.

Oliveira, É. R., Nie, L., Podstawczyk, D., Allahbakhsh, A., Ratnayake, J., Brasil, D. L., & Shavandi, A. (2021). Advances in growth factor delivery for bone tissue engineering. *International Journal of Molecular Sciences*, 22, 903. <https://doi.org/10.3390/ijms22020903>.

Prasad, S., & Farella, M. (2021). Speed limits to orthodontic treatment: A review. *New Zealand Dental Journal*, 117(3), 113-125.

Rayhan, M. A., Hossen, M. S., Niloy, M. S., Bhuiyan, M. H., Paul, S., & Shakil, M. S. (2021). Biopolymer and biomaterial conjugated iron oxide nanomaterials as prostate cancer theranostic agents: A comprehensive review. *Symmetry*, 13, 974. <https://doi.org/10.3390/sym13060974>.

Rosam, K., Monk, B. C., & Lackner, M. (2021). Sterol 14 $\alpha$ -demethylase ligand-binding pocket-mediated acquired and intrinsic azole resistance in fungal pathogens. *Journal of Fungi*, 7, 1. <https://doi.org/10.3390/jof7010001>.

Sardana, D., Manchanda, S., Ekambaram, M., Yang, Y., McGrath, C. P., & Yiu, C. K. Y. (2021). Prevention of demineralization during multi-bracketed fixed orthodontic treatment: An overview of systematic reviews. *International Journal of Paediatric Dentistry*, 32, 473-502. <https://doi.org/10.1111/ipd.12927>.

Zhao, R., Yang, R., Cooper, P. R., Khurshid, Z., Shavandi, A., & Ratnayake, J. (2021). Bone grafts and substitutes in dentistry: A review of current trends and developments. *Molecules*, 26(10), 3007. <https://doi.org/10.3390/molecules26103007>.

## Journal - Professional & Other Non-Research Articles

### Book Review

Badarneh, A. (2022). [Review of the book *Digital workflow in reconstructive dentistry*]. *New Zealand Dental Journal*, 118(1), 41.

Coburn, D. (2022). [Review of the book *Posterior direct restorations*]. *New Zealand Dental Journal*, 118(4), 177.

Goh, R. (2022). [Review of the book *The art of dental suturing: A clinical manual*]. *New Zealand Dental Journal*, 118(3), 115.

Goh, R. (2022). [Review of the book *Periodontitis and systemic diseases: Clinical evidence and biological plausibility*]. *New Zealand Dental Journal*, 118(4), 176.

McElroy, K. (2022). [Review of the book *Oral structure and biology*]. *New Zealand Dental Journal*, 118(1), 41.

Mei, P. (2022). [Review of the book *Dentofacial esthetics: From macro to micro*]. *New Zealand Dental Journal*, 118(1), 41.

Mei, P. (2022). [Review of the book *New straight wire: Strategies and mechanics for a programmed approach to orthodontic treatment*]. *New Zealand Dental Journal*, 118(3), 114.

Mei, P. (2022). [Review of the book *Sleep medicine for dentists: An evidence-based overview, second edition*]. *New Zealand Dental Journal*, 118(3), 114.

Ratnayake, J. (2022). [Review of the book *Dermal fillers for dental professionals*]. *New Zealand Dental Journal*, 118(2), 76.

Ratnayake, J. (2022). [Review of the book *Understanding Platelet-Rich Fibrin*]. *New Zealand Dental Journal*, 118(3), 115.

Senthilkumar, A. (2022). [Review of the book *Protocols for mobile dental photography with auxiliary lighting*]. *New Zealand Dental Journal*, 118(4), 177.

Badarneh, A. (2021). [Review of the book *Color in dentistry: A clinical guide to predictable esthetics*]. *New Zealand Dental Journal*, 117(2), 90.

Ratnayake, J. (2021). [Review of the book *The tongue*]. *New Zealand Dental Journal*, 117(3), 158.

Senthilkumar, A. (2021). [Review of the book *Communication skills for dental health care providers*]. *New Zealand Dental Journal*, 117(1), 44.

Senthilkumar, A. (2021). [Review of the book *Implant therapy: Clinical approaches and evidence of success*, 2nd ed.]. *New Zealand Dental Journal*, 117(2), 90.

Senthilkumar, A. (2021). [Review of the book *The art of occlusal and esthetic waxing*]. *New Zealand Dental Journal*, 117(3), 158.

Vedagiri, S. (2021). [Review of the book *Evidence-based dentistry for the dental hygienist*]. *New Zealand Dental Journal*, 117(1), 44.

Vedagiri, S. (2021). [Review of the book *Noncarious cervical lesions and cervical dentin hypersensitivity: Etiology, diagnosis and treatment*]. *New Zealand Dental Journal*, 117(2), 89.

Vedagiri, S. (2021). [Review of the book *Successful local anesthesia for restorative dentistry and endodontics*, 2nd edition]. *New Zealand Dental Journal*, 117(3), 158.

## Editorial

Cooper, P. (2022). A time of change. *New Zealand Dental Journal*, 118(1), 2.

## Conference Contribution - Published proceedings: Abstract

Abdelmoneim, D., Duncan, W., Li, K. C., Porter, G., Lim, K., & Coates, D. (2022). In vitro and in vivo investigation of antibacterial bone regenerative scaffolds. *New Zealand Dental Journal*, 118(4), (pp. 168).

Adam, L., Zhao, R., Wang, T., Yang, R., Zaharic, T., Loch, C., Tompkins, G., & Cooper, P. (2022). Linking theory to practice: Co-teaching biochemistry in dental education. *New Zealand Dental Journal*, 118(4), (pp. 172).

Al Naasan, Z., Duncan, W., Broadbent, J., & Smith, M. (2022). Cultural safety in dental practice for former refugee patients. *New Zealand Dental Journal*, 118(4), (pp. 173).

Anakin, M., Lee, C., Fleming, N., Beckingsale, L., & Olson, H. (2022). PeArL (Personally Arranged Learning Session): "Help, I'm doing a research project!" In M. Anakin, R. Bird, N. Flack, Q. Liu, J. McCallum-Loudeac & T. McLennan (Eds.), *Proceedings of the Sciences Education and Health Professions Education Symposium*. (pp. 16-17). Dunedin, New Zealand: University of Otago.

Arora, S., Cooper, P., Friedlander, L., Rizwan, S., Seo, B., Rich, A., & Hussaini, H. (2022). Evaluation of IL-23 inhibitor as a pulp immunomodulating agent: An in vitro and in vivo study. *New Zealand Dental Journal*, 118(4), (pp. 167).

Beckett, D., Broadbent, J., Loch, C., Wheeler, B., Mahoney, E., Drummond, B., Miller, S., & Gordon, K. (2022). Dental consequences of vitamin D deficiency during pregnancy and early infancy. *New Zealand Dental Journal*, 118(4), (pp. 170-171).

Cannon, R. (2022). Oral fungal infections: The benefit of sticking around [Keynote]. *New Zealand Dental Journal*, 118(4), (pp. 165).

Choudhury, M., Tompkins, G., Brunton, P., Dias, G., Pletzer, D., & Ratnayake, J. (2022). Gold nanoparticles against oropharyngeal pathogens in cancer therapy. *New Zealand Dental Journal*, 118(4), (pp. 168).

Clark, A. (2022). Investigating the so-called "CSI-Effect": undergraduate student views in Aotearoa New Zealand from 2017 to 2022. In M. Anakin, R. Bird, N. Flack, Q. Liu, J. McCallum-Loudeac & T. McLennan (Eds.), *Proceedings of the Sciences Education and Health Professions Education Symposium*. (pp. 12). Dunedin, New Zealand: University of Otago.

Clark, A. (2022). An anthropological perspective: Data sovereignty in forensic identification. *New Zealand Dental Journal*, 118(4), (pp. 165).

Feroz, S., Muhammad, N., Cathro, P., & Dias, G. (2022). Hydroxypropylmethyl cellulose (hpmc) cross-linked keratin/hydroxyapatite scaffold fabrication, characterization and in vitro biocompatibility assessment for alveolar bone regeneration. *Tissue Engineering Part A*, 28(Suppl. 2), B 127. <https://doi.org/10.1089/ten.tea.2022.29030.abstracts>

Guise, N., Broadbent, J., Li, K. C., Duncan, W., & Clark, A. (2022). Expanding the dentist's toolkit: Reproducing complex forensic trauma in a 3D format. *New Zealand Dental Journal*, 118(4), (pp. 165-166).

Heng, N., Stanton, J.-A., & Tompkins, G. (2022). The genetic basis of bacteriocin STH2 resistance in *Streptococcus mitis* I18. *New Zealand Dental Journal*, 118(4), (pp. 176).

Krishnan, C., Li, K. C., Lyons, K., Lamping, E., Tompkins, G., & Cannon, R. (2022). Evaluating the suitability of Electrolysed Oxidising Water as a denture disinfectant. *New Zealand Dental Journal*, 118(4), (pp. 169).

Krishnan, C. S., Li, K. C., Lyons, K. M., Tompkins, G. R., & Cannon, R. D. (2022). Evaluating the suitability of electrolysed oxidising water as a denture disinfectant. In L. Wilson, H. Harcombe, P. Jayakaran, L. Burga, J. Antony, K. Morgaine, M. Garelja, A. Middleton, M. Anwar & T. Milne (Eds.), *Proceedings of the 263rd Otago Medical School Research Society (OMSRS) Meeting: PhD Student Speaker Awards*. Dunedin, New Zealand: OMSRS. Retrieved from <https://ourarchive.otago.ac.nz/handle/10523/12839>.

- Larcombe, M., Norris, P., Cannon, R., & Stokes, T. (2022). Research impact in health sciences research: A scoping review. Proceedings of the New Zealand Primary Care Research Colloquium. (pp. 6). Retrieved from <https://www.auckland.ac.nz/en/fmhs/about-the-faculty/soph/sections-departments-centres/general-practice-and-primary-health-care/research-interests.html>.
- Lee, S. (2022). Oral habits: Are they as harmless as they seem? Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.
- Lee, S., Daniel, B., Farella, M., Mei, L., & Firth, F. (2022). Patients' experiences with orthodontic treatment through traditional fixed appliances, clear aligners and direct-to-consumer clear aligners: A qualitative study. *New Zealand Dental Journal*, 118(4), (pp. 175).
- Matheson, J., Carrington, S., & Clark, A. (2022). Tika or Tapu? The implementation and benefits of tikanga Māori and Te Ati Māori in forensic research hui. *New Zealand Dental Journal*, 118(4), (pp. 166).
- McBain, L., Smith, M., Hitchings, E., Clarke, M., & Yang, B. (2022). Embedding oral health in primary care. Proceedings of the New Zealand Primary Care Research Colloquium. (pp. 2). Retrieved from <https://www.auckland.ac.nz/en/fmhs/about-the-faculty/soph/sections-departments-centres/general-practice-and-primary-health-care/research-interests.html>.
- McFarlane, G., Loch, C., Guatelli-Steinberg, D., Bayle, P., Le Luyer, M., Sabel, N., ... White, S., ... Mahoney, P. (2022). A comparison of enamel daily sections rates in deciduous molars from modern-day children living in Aotearoa New Zealand, Britain, Canada, France, and Sweden. *American Journal of Biological Anthropology*, 177(S23), (pp. 118). <https://doi.org/10.1002/ajpa.24514>.
- Mei, L., Shi, C., Feng, Y., Hsiao, Y. C., Smith, J., Jin, C., & Farella, M. (2022). Clear aligners brands and marketing claims: An overview of available information on the web. *New Zealand Dental Journal*, 118(4), (pp. 175-176).
- Ng, B. (2022). Scleroderma is not only a dermatological condition.. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.
- Ng, B., Smith, M., & Samaranayaka, A. (2022). Use and utility of teledentistry in aged residential care (ARC) facilities in the Otago region of New Zealand. *New Zealand Dental Journal*, 118(4), (pp. 170).
- Nguyen, T. (2022). Management of a skeletal Class II malocclusion in a challenging patient. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.
- Nguyen, T., Bennani, V., Farella, M., & Mei, L. (2022). Stereophotogrammetric analysis of lip changes induced by simulated incisor protraction. *New Zealand Dental Journal*, 118(4), (pp. 174).
- Olson, H., Carrington, S., Tawse-Smith, A., & Adam, L. (2022). Students' experiences with using e-learning tools in early learning in dentistry. *New Zealand Dental Journal*, 118(4), (pp. 172).
- Pittar, N. (2022). Vertical limits: Managing high angled faces in orthodontics. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.
- Pittar, N., Farella, M., & Firth, F. (2022). The effect of clear aligners on masticatory muscle activity in adults with and without high oral parafunction. *New Zealand Dental Journal*, 118(4), (pp. 174-175).
- Praganta, J. (2022). Navigating postoperative turbulence: A case of pleomorphic adenoma of the palate. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.
- Praganta, J., De Silva, H., Thomson, M., De Silva, R., & Tong, D. (2022). Effects of Advanced Platelet-Rich Fibrin (A-PRF) on short-term third molar surgery outcomes: A single-blinded randomised controlled trial. *New Zealand Dental Journal*, 118(4), (pp. 174).
- Seow, J. M., Ma, S., Choi, J. J. E., & Tawse-Smith, A. (2022). Repairability of 3D-printed dentures. *New Zealand Medical Journal*, 135(1557), (pp. 104-105). Retrieved from <https://journal.nzma.org.nz/>.
- Sun, Q., Seo, B., Hussaini, H., Guan, S., & Rich, A. (2022). Expression of proinflammatory cytokines in cultured keratinocytes from specimens on oral lichen planus. *New Zealand Dental Journal*, 118(4), (pp. 166).
- Tan, N. (2022). Correlation advised. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.
- Tan, N., De Silva, R., De Silva, H., Thomson, M., & Tong, D. (2022). Knotless third molar wound closure. *New Zealand Dental Journal*, 118(4), (pp. 173).
- Tennekoon, S. (2022). Complex treatment needs in a patient with progressive disease. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.

- Tennekoon, S., Li, K. C., Guan, S., Ting, G., & Kelly, L. (2022). Analysis of changes in saliva composition in patients with oral and oropharyngeal cancer using Fourier Transform Infrared Spectroscopy. *New Zealand Dental Journal*, 118(4), (pp. 169).
- Toepfer, S., Keniya, M., & Lackner, M. (2022). Heterologous expression of *Candida auris* drug targets and efflux pumps in *Saccharomyces cerevisiae*. *New Zealand Dental Journal*, 118(4), (pp. 167).
- Tomiki, L. (2022). Beginning of a journey for a boy with Haemophilia A. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>.
- Tomiki, L., Meldrum, A., Adam, L., & Taylor, R. (2022). The effect of complementary feeding patterns on the oral health status of infants aged 7-10 months, New Zealand. *New Zealand Dental Journal*, 118(4), (pp. 171).
- Towle, I., MacIntosh, A. J. J., Berthaume, M., & Loch, C. (2022). Is atypical tooth wear described in fossil hominins caused by grit mastication? Potential evidence from a living primate population. *American Journal of Biological Anthropology*, 177(S23), (pp. 183). <https://doi.org/10.1002/ajpa.24514>
- Zainuddin, F. (2022). A journey to regain my smile. Proceedings of the Faculty of Dentistry Clinical Excellence Day. Retrieved from <https://www.otago.ac.nz/news/events/otago840725.html>
- Zainuddin, F. Z. A., Ting, G., Thomson, M., & Guan, S. (2022). Measuring dry mouth in older people in residential care in Dunedin. *New Zealand Dental Journal*, 118(4), (pp. 171).
- Arora, S., Wan, Z. T., Dong, F., Kalmadin, N. I., de Silva, H., Seo, B., Hussaini, H. M., & Rich, A. M. (2021). PD-L1 and FoxP3 expression in oral dysplastic tissues and oral squamous cell carcinoma. *Oral Surgery, Oral Medicine, Oral Pathology & Oral Radiology*, 132(1), (pp. e7-e8). <https://doi.org/10.1016/j.oooo.2021.03.043>
- Aziz, M. A., Seo, B., Hussaini, H. M., & Hibma, M. (2021). An in vitro examination of OSCC-derived exosomes. *Oral Surgery, Oral Medicine, Oral Pathology & Oral Radiology*, 132(1), (pp. e8). <https://doi.org/10.1016/j.oooo.2021.03.044>
- Carrington, S., Wyeth, E., Norris, P., & Priest, P. (2021). Applying a One Health Approach to exploring Māori understandings of antimicrobial resistance in Aotearoa/New Zealand: A qualitative investigation. Proceedings of the 12th Biennial Conference of the International Society of Critical Health Psychology (ISCHP). (pp. 52). Retrieved from <https://sites.google.com/view/ischp21>
- Dasent, J., Horne, L. S., & Shaw, A. (2021). Distinguishing between foreign pigmented lesions of the oral cavity using histological methods. *New Zealand Journal of Medical Laboratory Science*, 75(3), (pp. 241-242).
- Elahi, A., Duncan, W., Coates, D., Waddell, N., & Meledandri, C. (2021). Mechanical and biological validation of sintered bovine bone block grafts. Proceedings of the University of Otago Student Research Symposium: Te Wānaka Rakahau: Ākoka. (pp. 27).
- Heng, N., Han, R., Morgan, X., & Loch, C. (2021). The oral microbiome of killer whales (*Orcinus orca*). Proceedings of the 16th Congress of the Federation of Asian & Oceanic Biochemists & Molecular Biologists (FAOBMB). (pp. 134). Retrieved from <https://www.faobmb2021.org>.
- Hussaini, H. M., Phua, R., Seo, B., & Rich, A. M. (2021). Do myofibroblasts determine the biological behavior of odontogenic cysts and tumors? *Oral Surgery, Oral Medicine, Oral Pathology & Oral Radiology*, 132(1), (pp. e20-e21). <https://doi.org/10.1016/j.oooo.2021.03.085>
- Kao, A., Tawse-Smith, A., Ma, S., Duncan, W., & Reid, M. (2021). Titanium particulate release from mechanical surface instrumentation of titanium discs. *Clinical Oral Implants Research*, 32(22), (pp. 93). [https://doi.org/10.1111/clr.24\\_13856](https://doi.org/10.1111/clr.24_13856)
- Lamping, E., Niimi, M., Niimi, K., & Cannon, R. D. (2021). Substrate specificity of *Candida albicans* ATP-binding cassette transporter Cdr1 responsible for multidrug resistance. Proceedings of the 16th Congress of the Federation of Asian & Oceanic Biochemists & Molecular Biologists (FAOBMB). (pp. 62). Retrieved from <https://www.faobmb2021.org>.
- Thiyahuddin, N., Rich, A. M., Lamping, E., & Cannon, R. D. (2021). Microevolution of *Candida albicans* strains in older people with low salivary flow. *Oral Surgery, Oral Medicine, Oral Pathology & Oral Radiology*, 132(1), (pp. e48). <https://doi.org/10.1016/j.oooo.2021.03.172>
- Zainuddin, N. I., Hussaini, H. M., Seo, B., & Rich, A. M. (2021). Nerve sheath myxoma of the oral cavity. *Oral Surgery, Oral Medicine, Oral Pathology & Oral Radiology*, 132(1), (pp. e53). <https://doi.org/10.1016/j.oooo.2021.03.189>



## Conference Contribution - Edited volume of conference proceedings

Wilson, L., Harcombe, H., Jayakaran, P., Burga, L., Antony, J., Morgaine, K., Garelja, M., Middleton, A., Anwar, M., & Milne, T. (Eds.). (2022). Proceedings of the 262nd Otago Medical School Research Society (OMSRS) Meeting: Research Staff Speaker Awards. Dunedin, New Zealand. Retrieved from <https://ourarchive.otago.ac.nz/handle/10523/12839>.

Wilson, L., Harcombe, H., Jayakaran, P., Burga, L., Antony, J., Morgaine, K., Garelja, M., Middleton, A., Anwar, M., & Milne, T. (Eds.). (2022). Proceedings of the 263rd Otago Medical School Research Society (OMSRS) Meeting: PhD Student Speaker Awards. Dunedin, New Zealand. Retrieved from <https://ourarchive.otago.ac.nz/handle/10523/12839>.

Wilson, L., Harcombe, H., Jayakaran, P., Burga, L., Antony, J., Morgaine, K., Garelja, M., Middleton, A., Anwar, M., & Milne, T. (Eds.). (2022). Proceedings of the 264th Otago Medical School Research Society (OMSRS) Meeting: Masters/Honours Student Speaker Awards. Dunedin, New Zealand. Retrieved from <https://ourarchive.otago.ac.nz/handle/10523/12839>.

## Conference Contribution - Poster Presentation (not in published proceedings)

Deng, X., Gould, M., & Ali, A. (2022, August). 3D melt extrusion of PCL/PEG/curcumin-loaded PLA microspheres for suture applications. Poster session presented at the Advances in Microscopy Satellite Meeting: Queenstown Research Week, Queenstown, New Zealand.

Paul, S., Ali, A., & Katare, R. (2022, August-September). Investigating the effectiveness of a novel therapeutic to improve diabetic wound healing. Poster session presented at the New Zealand Medical Sciences Congress (MedSci), Queenstown, New Zealand.

Rajabi, M., Ali, A., Cabral, J., & Saunderson, S. (2022, August). Chitooligosaccharide-based inks for 3D printing of hard tissue scaffolds. Poster session presented at the Advances in Microscopy Satellite Meeting: Queenstown Research Week, Queenstown, New Zealand.

## Conference Contribution - Verbal presentation and other Conference outputs

Abdelmoneim, D., Duncan, W. J., Li, K. C., Porter, G. C., & Coates, D. E. (2022, September). Silverbone: In vitro and in vivo investigation of antibacterial bone regenerative scaffolds. Verbal presentation at the Postgraduate & Early Career Researchers Committee (PERC) & Division of Health Sciences Early & Mid-Career Researcher Joint Research Symposium, Dunedin, New Zealand.

Ali, A. (2022, November). Biomaterials and academic programme [Panel discussion: Centre for Bioengineering & Nanomedicine themes and future opportunities]. Verbal presentation at the Bioengineering@Otago Showcase.

Beckett, D. M., Broadbent, J., Loch, C., Wheeler, B., Mahoney, E., Drummond, B., Miller, S., & Gordon, K. (2022, September). Dental consequences of vitamin D deficiency during pregnancy and early infancy. Verbal presentation at the Postgraduate & Early Career Researchers Committee (PERC) & Division of Health Sciences Early & Mid-Career Researcher Joint Research Symposium, Dunedin, New Zealand.

Bhuiyan, M. H. (2022, July). Development and characterization of a novel thermoresponsive hydrogel for brain tissue regeneration after stroke. Verbal presentation at the Brain Health Research Centre (BHRC) Hui ā Tau Annual Conference: Te Haerenga o te tangata: Lifespan, Dunedin, New Zealand.

Bhuiyan, M. H., Ali, A., & Clarkson, A. (2022, August-September). Novel thermoresponsive hydrogels (NTH) to prevent reactive gliosis after stroke. Verbal presentation at the Australasian Society of Clinical & Experimental Pharmacologists & Toxicologists (ASCEPT) NZ Annual Scientific Meeting, Queenstown, New Zealand.

Cabral, J. (2022, September). Development of peptide-functionalized hydrogel biolinks to create 3D living wound dressings. Verbal presentation at the Postgraduate & Early Career Researchers Committee (PERC) & Division of Health Sciences Early & Mid-Career Researcher Joint Research Symposium, Dunedin, New Zealand.

Cai, M. (2022, November). Investigation of a novel injectable chitosan oligosaccharide-bovine hydroxyapatite hybrid dental biocomposite for the purposes of conservative pulp therapy. Verbal presentation at the Bioengineering@Otago Showcase.

Carrington, S. (2022, August). Cultural competency to cultural safety for dental technicians in New Zealand. Verbal presentation at the New Zealand Institute of Dental Technologists (NZIDT) Conference.

- Coates, D. (2022, November). Development of novel dental bone-grafting materials. Verbal presentation at the Bioengineering@Otago Showcase.
- Cridge, B., Broadbent, J., & Sellman, D. (2022, November). Supporting scientists who communicate contentious issues. Panel discussion at the Science Communicators Association of New Zealand (SCANZ) Conference: Communicating through the Noise, Dunedin, New Zealand.
- Senthilkumar, A., Adam, L., Gray, A., Loch, C., Lyons, K., & Brunton, P. (2022, November). Experiences and perceptions of New Zealand dental students' rapid move to online learning. Verbal presentation at the COVID-19's Impact on Teaching and Learning at the University of Otago: Lessons Learned Symposium, Dunedin, New Zealand.
- Tromp, M. (2022, August). Microbioarchaeology and the role of microscopy. Verbal presentation at the Advances in Microscopy Satellite Meeting: Queenstown Research Week, Queenstown, New Zealand.
- Aarts, J. (2021, August). The new recertification process: What you need to know. Verbal presentation at the New Zealand Institute of Dental Technologists (NZIDT) Conference, Wellington, New Zealand.
- Ahmadi, R. (2021, April-May). Creating the optimal dental environment for patients with additional needs. Verbal presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.
- Al Naasan, Z. (2021, July). A brief oral health promotion intervention in a group of Syrian former refugees resettled in Dunedin, NZ. Verbal presentation at the New Zealand Society of Hospital and Community Dentistry (NZSHCD) Conference, Dunedin, New Zealand.
- Antoun, J. (2021, April-May). Mobile photography: A new diagnostic tool? Plenary presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.
- Beckett, D. (2021, November). Student directed oral health education: A science preparatory platform. Verbal presentation at the College of Oral Health Academics (COHA) Virtual Conference: 100 years strong and still growing: Celebrating the past and moving into the future.
- Bennani, V. (2021, August). Clinical concepts of advanced removable partial denture design. Verbal presentation at the New Zealand Institute of Dental Technologists (NZIDT) Conference, Wellington, New Zealand.
- Broadbent, J. (2021, July). Dental visiting & unmet needs in the Dunedin study. Verbal presentation at the New Zealand Society of Hospital and Community Dentistry (NZSHCD) Conference, Dunedin, New Zealand.
- Broughton, J. R., Maipi, J., Person, M., & Thomson, W. M. (2021, May). Mokopuna Māori me Oranga Niho (Māori infants and oral health): He mahi rangahau. Verbal presentation at the Te Ao Mārama (The New Zealand Māori Dental Association) Hui-Ā-Tau, Ōtepoti, New Zealand.
- Carrington, S. (2021, April-May). The future role of oral health therapy. Verbal presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.
- Carrington, S., & Lacey, K. (2021, December). Cultural safety curriculum in New Zealand. Verbal presentation at the College of Oral Health Academics (COHA) Virtual Conference: 100 years strong and still growing: Celebrating the past and moving into the future.
- Choi, J. (2021, August). How we find answers to the everyday problems in dentistry? Verbal presentation at the New Zealand Institute of Dental Technologists (NZIDT) Conference, Wellington, New Zealand.
- Ekambaram, M. (2021, April-May). Arresting dentine caries in primary teeth using silver diamine fluoride. Verbal presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.
- Farrella, M. (2021, December). Orofacial pain: Pathophysiological aspects of masticatory muscle pain. Verbal presentation at the Pain@Otago Research Symposium.
- Kumar, Jr, R. (2021, October). The bula smile: Myth or reality? Verbal presentation at the Pacific Voices XVIII Postgraduate Research Symposium, Dunedin, New Zealand.

Moffat, S. (2021, April-May). Celebrating 100 Years of the NZ School Dental Service. Plenary presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.

Moffat, S. (2021, November). Celebrating 100 years of dental therapy. Verbal presentation at the College of Oral Health Academics (COHA) Virtual Conference: 100 years strong and still growing: Celebrating the past and moving into the future.

Moffat, S. (2021, May). Celebrating 100 years NZ Dental Service. Verbal presentation at the Te Ao Mārama (The New Zealand Māori Dental Association) Hui-Ā-Tau, Ōtepoti, New Zealand.

Moffat, S. (2021, April). Celebrating 100 years of School Dental Services. Verbal presentation at the New Zealand School & Community Oral Health Services Society (NZSCOHSS) Forum: Celebrating 100 Years, Nelson, New Zealand.

Morgan, M. (2021, April-May). The future: What do I know? Plenary presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.

Morgan, M. (2021, November). The future of oral health therapy. Verbal presentation at the College of Oral Health Academics (COHA) Virtual Conference: 100 years strong and still growing: Celebrating the past and moving into the future.

Nogueira, G. (2021, April-May). Periodontal surveillance: The key to improve the patient's outcome. Verbal presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.

Oda, K., Smith, M., Thomson, W. M., Ferguson, C. A., Bakri, N., Majeed, S., Bartlett, S., ... Parsons, J. (2021, October). Implementing oral care protocols in nursing practice in aged residential care facilities. Verbal presentation at the Hope Foundation for Research on Ageing Meeting.

Olson, H., & Anakin, M. (2021, April). Evaluating the feasibility of using framework of interprofessional competencies in the context of undergraduate dentistry, oral health, and medical laboratory science students in New Zealand. Verbal presentation at the Nordic Interprofessional Network (NIPNET) Conference.

Olson, H., Ronayne, C., & Anakin, M. (2021, November). Using a competency framework to evaluate an interprofessional orofacial pathology activity for undergraduate students. Verbal presentation at the College of Oral Health Academics (COHA) Virtual Conference: 100 years strong and still growing: Celebrating the past and moving into the future.

Ruiz Conrads, B. (2021, July). Childhood oral health & adult self-reported general health in two New Zealand birth cohort studies. Verbal presentation at the New Zealand Society of Hospital and Community Dentistry (NZSHCD) Conference, Dunedin, New Zealand.

Thiyahuddin, N. (2021, April-May). Xerostomia. Verbal presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.

Thiyahuddin, N. (2021, July). 'How is your community doing, Nurul?'. Verbal presentation at the Association for Women in the Sciences (AWIS) Triennial Conference: Embracing Diversity, Dunedin, New Zealand.

Ting, G. (2021, July). Bad to the bone. Verbal presentation at the New Zealand Society of Hospital and Community Dentistry (NZSHCD) Conference, Dunedin, New Zealand.

Tong, D. (2021, April-May). Lumps, bumps, craters and patches: The subtle art of getting worried. Plenary presentation at the New Zealand Dental Hygienist's Association (NZDHA) and the New Zealand Dental and Oral Health Therapists Association (NZDOHTA) Annual Conference: Past, Present and Future: Celebrating 100 Years of the New Zealand School Dental Service, Dunedin, New Zealand.

## Other Research Output

### Department Seminar

Carrington, S. (2021, October). Exploring Māori views and understandings of antimicrobial resistance in Aotearoa New Zealand: A qualitative investigation using a One Health approach. Department of Preventive & Social Medicine Research Student Seminars, University of Otago.

### Inaugural Professorial Lecture

Broadbent, J. (2022, October). Getting long-itudinal in the tooth: Caries, trajectories, and disparities. University of Otago, Dunedin, New Zealand.

## Public Discussion

Elahi, A., Bekhit, A. E. D. & Suleman, M. A. (2022, September). Halal and you: Understanding Halal business and diet. Panel discussion at the University of Otago Muslim University Students' Association, Dunedin, New Zealand.

## Awarded Doctoral Degree

Boyd, D. H. (2022). Outcomes of restorative dental treatment with the Hall technique in New Zealand primary care (PhD). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12814>.

Hosseini, P. (2022). Analysis of *Aspergillus fumigatus* CYP51 isoforms as drug targets (PhD). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12905>.

Lee, S. (2022). Patients' experiences with orthodontic treatment through traditional fixed appliances, clear aligners and direct-to-consumer clear aligners: A qualitative study (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/14173>.

Mohammed, H. M. Y. A. (2022). Impact of malocclusion on smiling features (PhD). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/13686>.

Ng, B. M. M. (2022). Acceptability and feasibility of teledentistry use in aged residential care facilities in the Otago region of New Zealand (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/14154>.

Ngah, N. A. B. (2022). Collagen-bioglass-lyophilised platelet rich-fibrin scaffold for craniofacial regeneration (PhD). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/13503>.

Nguyen, K. T. (2022). Stereophotogrammetric analysis of lip changes induced by simulated incisor protraction (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/14152>.

Pittar, N. P. (2022). Effect of passive clear aligners on masticatory muscle activity in adults with and without high oral parafunction (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/14141>.

Praganta, J. (2022). Clinical effects of advanced platelet-rich fibrin (A-PRF) on the outcomes of third molar removal surgery: A randomised controlled trial (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/14151>.

Tan, N. R. (2022). A comparison between knotless and conventional sutures: A novel approach to third molar surgery (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/14153>.

Tennekoon, S. C. (2022). Analysis of changes in saliva composition in patients with oral cancer and oropharyngeal cancer using Fourier transform infrared spectroscopy (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/14174>.

Abdul Aziz, M. S. B. (2021). Changes in mineral density and nanomechanical properties of enamel white spot lesions by dentifrices with different active ingredients for remineralisation: An in vitro study (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12517>.

Al Naasan, Z. (2021). Community based oral health promotion among adult Syrian former refugees resettled in Dunedin, New Zealand (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12511>.

Aziz, M. A. (2021). Exploration of exosomes as potential biomarkers for oral cancers (PhD). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12197>.

Badarneh, A. S. M. (2021). The effect of aging on the wear performance of monolithic zirconia (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12518>.

Benn, C. (2021). Promoting oral health in pregnancy: Exploring the needs of lead maternity care midwives (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12503>.

Brunton, P. A. (2021). Improving the evidence base for primary dental care (DDSc). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/11957>.

Hunt, G. R. (2021). Students' perceptions of undergraduate endodontic education and the impact of the COVID-19 pandemic in New Zealand (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12523>.

Jefferies, E. A. (2021). Oral health and oral-health-related quality of life of a group of young adults using mental health services in Christchurch (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12515>.



Kao, A. Y.-C. (2021). Effect of mechanical decontamination procedures on moderately roughened titanium surfaces: Quantity and size of the titanium particulate released by mechanical instrumentation (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12513>.

Kumar, R. A. J. (2021). What's in a smile? An investigation of the effect of ethnic background on smiling features (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12524>.

Mohamed Ashri, M. H. B. (2021). Perceived confidence in performing peripheral venipuncture among dental practitioners in New Zealand and Malaysia (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12526>.

Nath, S. J. C. (2021). Biomimetic remineralisation: A comparative evaluation of the enamel remineralisation potential of a short, medium, and long chain self-assembling peptide (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12522>.

Paterson, M. A. (2021). Modulation of osteoblasts and periodontal ligament cells by IL-17 and IL-6 (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12520>.

Ruma, Y. N. (2021). Development of *Cryptococcus neoformans* and *Candida parapsilosis* lanosterol 14 $\alpha$ -demethylase (CYP51) as drug targets (PhD). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12104>.

Rupasinghe, M. L. (2021). Oncology and dentistry: A regional hospital perspective (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12519>.

Skilbeck, M. G. (2021). Surface modification of orthodontic elastomers to overcome biofilm formation (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12512>.

Smith, J. M. (2021). Predictability of lower incisor root tip with the invisalign appliance (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12521>.

Yong, D. (2021). Development and analysis of a novel bovine hydroxyapatite calcium silicate cement for conservative pulp therapy (DClinDent). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12506>.

### Awarded Masters Degree

Carrington, S. D. (2022). Using a One Health approach to explore Māori experts' views on antimicrobial resistance: A qualitative study (MPH). University of Otago, Dunedin, New Zealand. Retrieved from <http://hdl.handle.net/10523/12844>.



## Research funding summary, 2021-2022

Funding/contracting body	2021	2022	Total
AbbVie Limited (for 23andMe, Inc)	\$15,320		\$15,320
Catalyst: Seeding (Royal Society of New Zealand)		\$80,000	\$80,000
Clare Foundation	\$5,000		\$5,000
Colgate Palmolive Limited (NZ)	\$40,000		\$40,000
FORENZAO Charitable Trust		\$3,500	\$3,500
Fuller Scholarships (Downie Stewart)	\$20,000	\$24,314	\$44,314
Health Research Council of NZ (HRC)	\$427,985	\$156,078	\$584,063
Institute of Environmental Science and Research Limited (ESR)		\$5,000	\$5,000
International College of Prosthodontists		\$6,349	\$6,349
Kiwi Innovation Network Limited	\$10,000		\$10,000
Manuka Bioscience Ltd		\$33,175	\$33,175
Maurice and Phyllis Paykel Trust	\$6,000	\$17,500	\$23,500
Medical Assurance Society Foundation		\$56,522	\$56,522
Ministry of Business, Innovation and Employment	\$999,500		\$999,500
Ministry of Health Oral Health Research Fund	\$61,537	\$73,205	\$134,742
Nakao Foundation for Worldwide Oral Health	\$65,882		\$65,882
New Zealand Dental Research Foundation	\$185,220	\$137,429	\$322,649
New Zealand Institute of Dental Technologists		\$16,710	\$16,710
New Zealand Lottery Grants Board	\$124,121		\$124,121
New Zealand Research Foundation of the ANZHNCs	\$11,384		\$11,384
Otago Innovation Limited	\$25,223		\$25,223
Periomedic Limited		\$40,000	\$40,000
Plant and Food Research	\$14,450		\$14,450
Science for Technological Innovation National Science Challenge	\$3,000	\$200,000	\$203,000
SJWRI Sir Thomas Kay Sidey Research Start-up Fund		\$21,791	\$21,791
University of Otago Research Grants	\$59,795	\$160,599	\$220,394
World Rugby	\$459,149		\$459,149
<b>Total - Sir John Walsh Research Institute</b>	<b>\$2,533,566</b>	<b>\$1,032,172</b>	<b>\$3,565,738</b>

*All funding is listed in New Zealand dollars, GST exclusive.*

*Data courtesy Lorraine Harris, Research and Enterprise, University of Otago.*

## Full listing of SJWRI research funding, 2021-2022

Competitive and commercial research funding commencing or awarded in 2021-2022

*This listing includes all projects led by or involving named investigators from the SJWRI. Awards are presented in chronological order of start date, grouped by funder. Funding is in New Zealand dollars, GST exclusive. All affiliations are SJWRI/University of Otago unless noted otherwise. Lead investigators are listed in **bold**. \*Student investigators are asterisked.*

*Data courtesy Lorraine Harris, Research and Enterprise, University of Otago.*

Funder/Award	Project title	Duration	Amount	Investigators
New Zealand Dental Research Foundation BDS HONS RESEARCH AWARDS	<i>An overlooked conundrum to the open sandwich technique: effects of saliva and blood contamination on bonding between resin-modified glass ionomer cements and composite resins</i>	1 Jan 21 - 31 Dec 21	\$5,000	<b>May (Lei) Mei</b> , Kit Meng Mar*
New Zealand Dental Research Foundation BDS HONS RESEARCH AWARDS	<i>Effects of printing angulation setting and sterilisation protocol on the accuracy and dimensional stability of 3D-printed implant surgical guides</i>	1 Jan 21 - 31 Dec 21	\$5,000	<b>Sunyoung Ma</b>
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Promoting and protecting the oral health of dependent older New Zealanders 'ageing in place'</i>	1 Jan 21 - 31 Jul 23	\$44,000	<b>Moir Smith</b> (Public Health, UOW), Catherine Ferguson (Public Health, UOW), Graeme Ting
University of Otago UNIVERSITY OF OTAGO RESEARCH GRANTS	<i>Aerosol generation level by different dental high-speed handpieces</i>	1 Jan 21 - 31 Dec 21	\$29,488	<b>Joanne Choi</b> , Jane Choi, Susan Moffat, Neil Waddell
University of Otago UNIVERSITY OF OTAGO RESEARCH GRANTS	<i>Development of a novel bioactive ovine-teeth derived dental putty for clinical applications</i>	1 Jan 21 - 30 Sep 22	\$30,307	<b>Jithendra Ratnayake</b> , Samuel Carrington, Paul Cooper, George Dias (Anatomy)
AbbVie Limited (for 23andMe, Inc)	<i>Consulting agreement for licensing of Xerostomia Inventory as developed by Murray Thomson</i>	1 Mar 21 - 31 Dec 21	\$15,320	<b>Murray Thomson</b>
New Zealand Lottery Grants Board LOTTERY HEALTH - RESEARCH EQUIPMENT	<i>Zygo ZeGage Pro 3D Optical Surface Profiler</i>	1 Mar 21 - 31 Oct 22	\$124,121	<b>Fiona Firth</b>
Callaghan Innovation SCIENCE FOR TECHNOLOGICAL INNOVATION SEED PROPOSAL	<i>NSC SfTI: Creation of a novel white plastic for use as tool</i>	1 Apr 21 - 30 Sep 21	\$3,000	<b>Joanne Choi</b> , Rafaela Rabello (Commerce Divisional Office)
World Rugby	<i>Otago Rugby Community Head Impact Detection (ORCHID) study</i>	1 Apr 21 - 31 May 23	\$459,149	<b>Melanie Bussey</b> (School of Physical Education), Gisela Sole (Physiotherapy), Darryl Tong

Funder/Award	Project title	Duration	Amount	Investigators
Maurice and Phyllis Paykel Trust PROJECTS AND EQUIPMENT	<i>Understanding tooth size and morphology differences in NZ children: applications for the development of novel white shell crowns to treat dental caries</i>	1 May 21 - 30 Apr 22	\$6,000	Joanne Choi, Samuel Carrington, Warwick Duncan, Susan Moffat, Jiaxu Zeng (Preventive & Social Medicine, DSM)
Otago Innovation Limited	<i>"Silverbone" - unique antibacterial biomaterial</i>	1 May 21 - 31 Oct 22	\$25,223	Warwick Duncan, Tanmoy Bhattacharjee
Health Research Council of NZ 2021 EXPLORER GRANTS	<i>A Smart Toothpaste for the Twenty First Century</i>	1 Jul 21 - 30 Jun 23	\$150,000	George Dias (Anatomy), Vincent Bennani, Niranjana Ramesh (Anatomy)
Colgate Palmolive Limited (NZ)	<i>Sugar in your diet - kino te pai!</i>	1 Aug 21 - 30 Sep 23	\$40,000	Carolina Loch Santos da Silva, Deanna Beckett, Getulio Nogueira
Health Research Council of NZ 2021 HEALTH DELIVERY RESEARCH ACTIVATION GRANT 1	<i>Framework for developing a interdisciplinary temporomandibular disorder clinic</i>	1 Aug 21 - 31 Jan 23	\$28,708	Carrie Falling (Physiotherapy), Matthew Dick (Physiotherapy), Guangzhao Guan, Ramakrishnan Mani (Physiotherapy)
Health Research Council of NZ FEASIBILITY STUDIES	<i>Novel white crowns for drill-free treatment of dental caries in NZ children</i>	1 Aug 21 - 31 Jan 24	\$249,277	Joanne Choi, Samuel Carrington, Warwick Duncan, Susan Moffat, Jiaxu Zeng (Preventive & Social Medicine, DSM)
Kiwi Innovation Network Limited	<i>Novel white plastic tooth-crowns for drill-free management of decay in children's teeth</i>	1 Aug 21 - 31 Mar 22	\$10,000	Joanne Choi
Nakao Foundation for Worldwide Oral Health RESEARCH GRANT	<i>Development of a bio-inspired resin modified glass ionomer cement for root caries management</i>	1 Aug 21 - 30 Jun 23	\$65,882	May (Lei) Mei, Manikandan Ekambaram, Kai Chun Li
Ministry of Business, Innovation and Employment ENDEAVOUR FUND SMART IDEAS	<i>Novel Manuka oil antibacterial medicaments to promote bone regeneration in oral wounds</i>	1 Oct 21 - 30 Sep 24	\$999,500	Warwick Duncan, Dawn Coates, Kai Chun Li, Natalie Medlicott (Pharmacy), Neil Waddell
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Hyperglycaemia and the dental pulp - so what about angiogenesis?</i>	1 Oct 21 - 30 Sep 23	\$14,989	Lara Friedlander, Paul Cooper, Haizal Hussaini, Trudy Milne
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Improving oral health-related quality of life among Canterbury children following dental treatment under general anaesthesia: the role of family functioning</i>	1 Oct 21 - 31 Mar 23	\$19,000	Murray Thomson, Manikandan Ekambaram



Funder/Award	Project title	Duration	Amount	Investigators
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Understanding tooth size and morphology differences in NZ children: applications for the development of novel white shell crowns to treat dental caries</i>	1 Oct 21 - 30 Sep 23	\$17,000	<b>Joanne Choi</b> , Samuel Carrington, Warwick Duncan, Susan Moffat
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Workplace oral health promotion: impact and acceptability to those working in the aged care setting</i>	1 Oct 21 - 30 Sep 23	\$10,548	<b>Moira Smith</b> (Public Health, UOW), Jonathan Broadbent, Murray Thomson, Noor Nazahiah Bakri*
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>'Hyperbaric Oxygen: Who wants it?' A case series analysis of patients referred for hyperbaric oxygen from dentists, maxillofacial surgeons and otolaryngologists in the prevention or treatment of osteoradionecrosis (ORN) in New Zealand</i>	1 Oct 21 - 30 Sep 23	\$4,880	<b>Murray Thomson</b> , Graeme Ting, Jack Lintern*, Joanna Ngo (Auckland DHB), Guo Ling (Auckland DHB)
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>An in vitro study of the effect of various titanium surface treatments and simulated ageing process on the bonding between zirconia implant crowns and titanium bases</i>	1 Oct 21 - 30 Sep 23	\$15,000	<b>Sunyoung Ma</b> , Joanne Choi, Suzanne Hanlin
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Antibacterial GelMA constructs containing alpha lipoic acid-capped silver nanoparticles for bone tissue regeneration</i>	1 Oct 21 - 30 Sep 23	\$14,899	<b>Dawn Coates</b> , Warwick Duncan, Khoon Lim (Orthopaedic Surgery, UOC)
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Antibiofilm efficacy of gold nanoparticles against oropharyngeal pathogens in oral mucositis</i>	1 Oct 21 - 31 Mar 23	\$9,668	<b>Don Schwass</b> , Geoffrey Tompkins, Minati Choudhury*, Paul Brunton (Health Sciences), Carla Meledandri (Chemistry)
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Cytokine modulation in response to Nisin Z lantibiotic with application in periodontal inflammation: a proof of concept study</i>	1 Oct 21 - 30 Sep 23	\$14,302	<b>Getulio Nogueira</b> , Dawn Coates, Warwick Duncan
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Developing and validating a finite element model for all-ceramic monolithic zirconia crown material using Coulomb-Mohr and von Mises yield criterion</i>	1 Oct 21 - 30 Sep 23	\$15,000	<b>Kai Chun Li</b> , Abdullah Barazanchi, Neil Waddell
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Development of a lactoferrin hydrolysable gel system for bone regeneration</i>	1 Oct 21 - 30 Sep 23	\$14,597	<b>Dawn Coates</b> , Warwick Duncan, Khoon Lim (Orthopaedic Surgery, UOC)
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Diabetes and Endodontics - Unravelling the potential for calcifications within the pulp?</i>	1 Oct 21 - 30 Sep 23	\$13,032	<b>Lara Friedlander</b> , Trudy Milne, Peter Cathro, Paul Cooper

Funder/Award	Project title	Duration	Amount	Investigators
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Quantification and characterisation of dental pulp inflammatory markers for development of a clinical decision-making tool: A pilot study</i>	1 Oct 21 - 30 Sep 23	\$14,842	<b>Finn Gilroy</b> , Paul Cooper, Lara Friedlander, Haizal Hussaini
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>The effect of dentifrices with different active ingredients on enamel regenerative potential of self-assembling peptide P11-4</i>	1 Oct 21 - 30 Sep 23	\$15,000	<b>Manikandan Ekambaram</b> , Kai Chun, May (Lei) Mei
New Zealand Research Foundation of the ANZHNCs NZRF RESEARCH GRANT	<i>Gold nanoparticles efficacy against oropharyngeal pathogens in oral mucositis</i>	1 Oct 21 - 30 Sep 22	\$11,384	<b>Don Schwass</b> , Geoffrey Tompkins, Minati Choudhury, Paul Brunton, Carla Meledandri (Chemistry)
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>Cleft Project - The Search for a Confident Smile</i>	1 Oct 21 - 30 Sep 23	\$5,000	<b>Mauro Farella</b> , Lucinda Wong*, Fiona Firth
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>The effect of dental bleaching materials on the physical properties of Invisalign orthodontic aligners</i>	1 Oct 21 - 30 Sep 23	\$5,000	<b>Paul Brunton</b> , Karl Lyons, Majd Khashashneh*, Joanne Choi, Li Mei
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>Hypomineralised teeth: perspectives of those severely affected and New Zealand orthodontists</i>	1 Nov 21 - 31 Oct 23	\$5,000	<b>Fiona Firth</b> , Charlotte Hurst*, Jonathan Broadbent, Manikandan Ekambaram, Mauro Farella
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>Can orthodontic clear retainers be used for tooth whitening?</i>	1 Dec 21 - 30 Nov 23	\$5,000	<b>Li Mei</b> , Carrol Jin*, Jonathan Broadbent, Paul Brunton, Mauro Farella
Clare Foundation	<i>Career satisfaction among oral health therapists</i>	1 Dec 21 - 28 Feb 22	\$5,000	<b>Murray Thomson</b>
Plant and Food Research	<i>Chemical modifications of fish collagen as a 3D scaffold biomaterial for soft tissue engineering applications</i>	1 Dec 21 - 30 Nov 24	\$14,450	<b>Azam Ali</b> , Alexandria Leonard*
University of Otago UNIVERSITY OF OTAGO RESEARCH GRANTS	<i>Bulk-fill vs. conventional dental composites: a novel approach to fatigue failure analysis</i>	1 Jan 22 - 28 Feb 23	\$19,110	<b>Kai Chun Li</b> , Neil Waddell
University of Otago UNIVERSITY OF OTAGO RESEARCH GRANTS	<i>Development of tissue-protective Vacuum Clamps for mechanical testing of brain tissue relevant for traumatic head impact research using computational models</i>	1 Jan 22 - 31 Dec 22	\$36,391	<b>May (Lei) Mei</b> , Kai Chun Li, Johann Zwirner (Anatomy)
University of Otago UNIVERSITY OF OTAGO RESEARCH GRANTS	<i>Electroencephalographic signature of TMD patients: clinical implications.</i>	1 Jan 22 - 31 Dec 22	\$16,297	<b>Li Mei</b> , Guangzhao Guan, Zhiyi Huang (Computer Science)

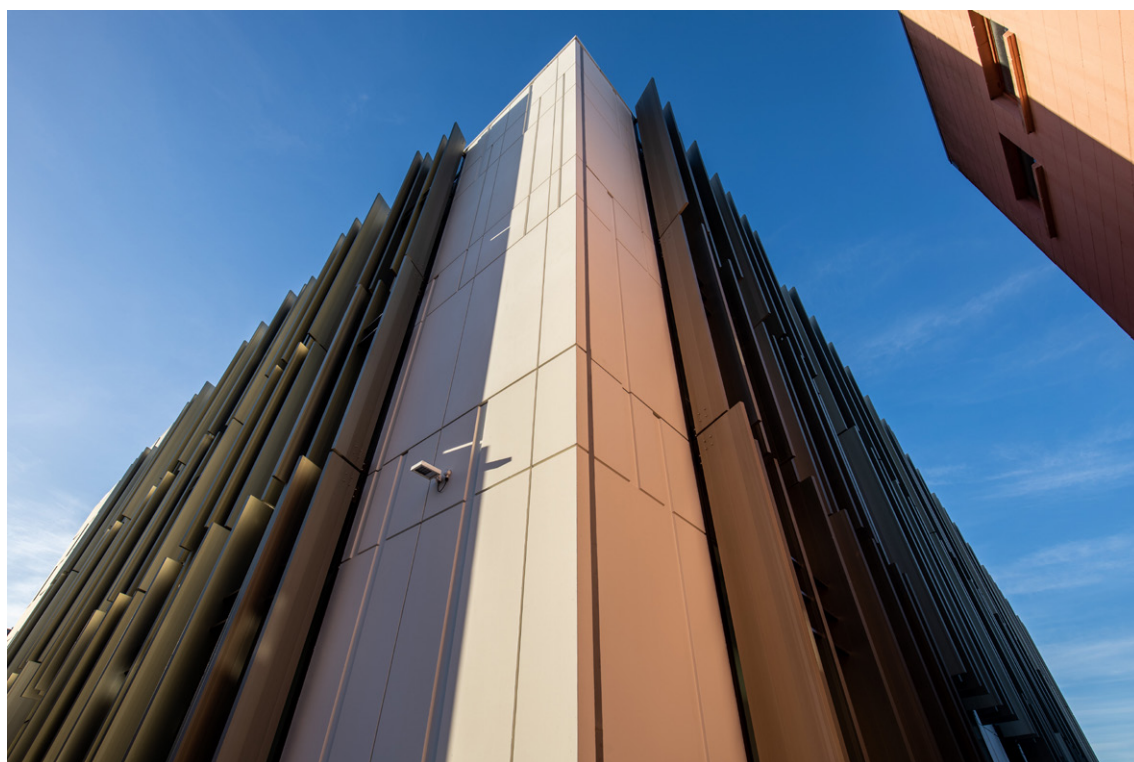
Funder/Award	Project title	Duration	Amount	Investigators
University of Otago UNIVERSITY OF OTAGO RESEARCH GRANTS	<i>Nanotopography and nanomechanic analysis of living cells using atomic force microscopy for early diagnosis of oral cancer</i>	1 Jan 22 - 31 Dec 22	\$28,331	<b>Guangzhao Guan</b> , Richard Cannon, Li Mei
University of Otago UNIVERSITY OF OTAGO RESEARCH GRANTS	<i>Scanning for justice: the impact of 3D visualisation of skeletal trauma in Aotearoa New Zealand courts</i>	1 Jan 22 - 31 Dec 23	\$60,470	<b>Angela Clark</b> , Joanne Baxter (Kōhatu - Centre for Hauora Māori), Rachel Zajac (Psychology), Jason Barr (ESR)
Medical Assurance Society Foundation	<i>TooTs: A health-promoting dental storybook for New Zealand Children</i>	1 Feb 22 - 31 Jan 24	\$56,522	<b>Jonathan Broadbent</b> , Samuel Carrington, Jarden Kuramaiki Lacey, Kate Morgaine (Preventive & Social Medicine, DSM)
New Zealand Dental Research Foundation BDS HONS RESEARCH AWARDS	<i>Effects of bur lifespan on CAD/CAM milled zirconia and lithium disilicate crowns</i>	1 Feb 22 - 31 Dec 22	\$5,000	<b>Sunyoung Ma</b> , Burhan Haidermota*, Joanne Choi
New Zealand Dental Research Foundation BDS HONS RESEARCH AWARDS	<i>M1 and M2 macrophages in pulp health and disease</i>	1 Feb 22 - 31 Dec 22	\$5,000	<b>Paul Cooper</b> , Linbei Ke*, Finn Gilroy, Haizal Hussaini
New Zealand Dental Research Foundation BDS HONS RESEARCH AWARDS	<i>The effect of decontamination procedures on the microshear bond strength of resin-modified glass ionomer cement to resin composite contaminated with blood</i>	1 Feb 22 - 31 Dec 22	\$5,000	<b>Manikandan Ekambaram</b> , Yuen Xin Chia*, Paul Cooper, Kai Chun Li, May (Lei) Mei
Royal Society of New Zealand CATALYST: SEEDING	<i>A learner-centred approach for incorporating virtual reality tools in the undergraduate curricula for dental and oral health students in Belgium, New Zealand and Sweden</i>	1 Feb 22 - 31 Jan 24	\$80,000	<b>Andrew Tawse-Smith</b> , Hanna Olson, Sam Carrington
Callaghan Innovation KAUPAPA KAKANO SEED PROJECTS	<i>NSC SfTI: Optimising novel white plastic crowns for drill-free caries in children</i>	1 Mar 22 - 28 Feb 24	\$200,000	<b>Joanne Choi</b> , Samuel Carrington, Susan Moffat, Warwick Duncan
Health Research Council of NZ 2021 HEALTH DELIVERY RESEARCH ACTIVATION GRANT 2	<i>Feasibility of oral pathology tissue bank for Maori and Pasifika</i>	1 Mar 22 - 31 Aug 23	\$26,630	<b>Haizal Hussaini</b> , Samuel Carrington, Paul Cooper, Alison Rich, Benedict Seo
Health Research Council of NZ 2021 HEALTH DELIVERY RESEARCH CAREER DEVELOPMENT AWARD 2	<i>Tooth Wisdom: Integrating refugee cultural competency into dental practice</i>	1 Mar 22 - 31 Aug 23	\$44,448	<b>Zeina Al Naasan</b> , Moira Smith (Public Health, UOW)
Institute of Environmental Science and Research Limited (ESR)	<i>New methods of body storage and disposal</i>	1 Apr 22 - 30 Jun 22	\$5,000	<b>Angela Clark</b>

Funder/Award	Project title	Duration	Amount	Investigators
Maurice and Phyllis Paykel Trust CONFERENCE SUPPORT	<i>NZ Microbiology Society Conference - 'Microbes Rule!'</i>	1 Aug 22 - 31 Dec 22	\$4,500	Nicholas Heng
Periomedic Limited	<i>Periomedic Clinical Validation Trials 1</i>	1 Sep 22 - 31 Mar 23	\$40,000	Warwick Duncan
Manuka Bioscience Ltd	<i>Evaluate bioactive penetration into skin via non-invasive (in vitro) technique</i>	1 Oct 22 - 30 Sep 23	\$33,175	Azam Ali, Maree Gould
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Cleft Project - The Search for a Confident Smile</i>	1 Oct 22 - 30 Sep 23	\$25,908	Mauro Farella, Fiona Firth, Peter Fowler, Hannah Jack, Lucinda Wong*
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Management of deep caries in permanent teeth Let's be consistent!</i>	1 Oct 22 - 30 Sep 24	\$7,326	Lara Friedlander, Jonathan Broadbent, Ben Daniel Motidyang (HEDC), Finn Gilroy
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>The Influence of Socioeconomic Position on Intergenerational Continuities in Oral Health and Oral Self-Care</i>	1 Oct 22 - 30 Sep 23	\$38,830	Jonathan Broadbent
New Zealand Dental Research Foundation MINISTRY OF HEALTH ORAL RESEARCH FUND	<i>Trends in facial fractures in New Zealand from 2010 to 2021</i>	1 Oct 22 - 30 Sep 24	\$1,141	Harsha De Silva, Jonathan Broadbent, Jesse Kokaua (Health Sciences Pacific), Peter Sese, Darryl Tong
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Assessment of the marginal integrity, internal fit and bond strength of long term CAD/CAM and 3D printed interim crowns</i>	1 Oct 22 - 30 Sep 24	\$14,988	Sunyoung Ma, Joanne Choi
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Correlation of three wear test modules and post-analysis methods for dental materials</i>	1 Oct 22 - 30 Sep 24	\$12,000	Joanne Choi
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Development of a novel ovine tooth putty for dental surgery applications</i>	1 Oct 22 - 30 Sep 24	\$14,764	Jithendra Ratnayake, Paul Cooper
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Development of an easy-handling, bioinductive hydroxyapatite-silicate-silk cement for use in vital pulp therapy</i>	1 Oct 22 - 30 Sep 24	\$12,650	Peter Cathro, Azam Ali, Lara Friedlander, Jithendra Ratnayake
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Effect of various printing parameters on the accuracy of 3D-printed partial denture framework.</i>	1 Oct 22 - 30 Sep 23	\$8,700	Joanne Choi
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Endoplasmic reticulum stress in oral lichen planus</i>	1 Oct 22 - 30 Sep 24	\$15,000	Benedict Seo, Paul Cooper, Haizal Hussaini, Alison Rich, Qing Sun



Funder/Award	Project title	Duration	Amount	Investigators
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Novel 3D PCL hollow pipe scaffold with bone cement infiltration for bone regeneration and vascularisation of large bone defects in dentistry.</i>	1 Oct 22 - 30 Sep 24	\$14,890	<b>Dawn Coates,</b> Joanne Choi, Warwick Duncan
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>Remineralisation of early enamel caries with adjunctive application of bioinspired peptide and fluoride varnish: an in vitro study</i>	1 Oct 22 - 30 Sep 24	\$14,490	<b>May (Lei) Mei,</b> Manikandan Ekambaram, Kai Chun Li
New Zealand Dental Research Foundation NZDRF RESEARCH GRANTS	<i>The antibacterial and mechanical properties of nanostructured TiO<sub>2</sub> anatase-rutile carbon coatings on metal orthodontic appliances</i>	1 Oct 22 - 30 Sep 24	\$14,947	<b>Richard Cannon,</b> Mauro Farella
University of Otago Foundation Trust SJWRI SIR THOMAS KAY SIDEY RESEARCH STARTUP AWARD	<i>Migrants' experiences of accessing and receiving oral health care in New Zealand- A qualitative study</i>	1 Oct 22 - 30 Sep 24	\$9,375	<b>Zeina Al Naasan,</b> Moirra Smith (Public Health, UOW)
University of Otago Foundation Trust SJWRI SIR THOMAS KAY SIDEY RESEARCH START-UP AWARD	<i>Visit experience of dental anxiety patients treated by dental students at University clinic</i>	1 Oct 22 - 30 Sep 24	\$12,416	<b>Arthi Senthilkumar,</b> Karl Lyons, David Roessler
Foundation for Orthodontic Research & Education, NZAO	<i>The effect of posterior bite raising by clear aligners on habitual activity of the masticatory muscles</i>	1 Nov 22 - 31 Oct 24	\$3,500	<b>Mauro Farella</b>
Health Research Council of NZ MĀORI HEALTH RESEARCH PHD SCHOLARSHIPS	<i>Mamaku; ethnobiology and use as a novel intraoral medicament - an in vitro study</i>	1 Nov 22 - 30 Apr 25	\$85,000	<b>Warwick Duncan,</b> Jonathan Martin*
Maurice and Phyllis Paykel Trust PROJECTS AND EQUIPMENT	<i>Understanding the efflux pump function of Candida albicans Cdr1</i>	1 Nov 22 - 31 Oct 23	\$13,000	<b>Richard Cannon,</b> Erwin Lamping, Masakazu Niimi
Fuller Scholarship - Downie Stewart SJWRI DCLINDENT RESEARCH GRANTS	<i>Accuracy of guided implant surgery compared to partially-guided and free-hand implant surgery: an in vitro study</i>	1 Dec 22 - 30 Nov 24	\$5,000	<b>Sunyoung Ma,</b> Harsha De Silva, Steven McKinstry*, Darryl Tong
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>Dental avulsion injuries in New Zealand – The experiences of affected children and their families</i>	1 Dec 22 - 30 Nov 24	\$4,950	<b>Manikandan Ekambaram,</b> Ben Daniel Motidyang (HEDC), Finn Gilroy, Aiswarya Kesava*, Alison Meldrum

Funder/Award	Project title	Duration	Amount	Investigators
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>Oral function and oral health experiences of stroke survivors</i>	1 Dec 22 - 30 Nov 24	\$4,930	<b>Carolina Loch Santos da Silva</b> , Daniela Aldabe (Physiotherapy), Esther Cheong*, Mauro Farella, Nurulhuda Thiyahuddin
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>Strain gauge placement in assessing passive fit of the multi-implant fixed dental prosthesis framework</i>	1 Dec 22 - 30 Nov 24	\$4,439	<b>Karl Lyons</b> , John Aarts, Vincent Bennani, Yongping Chen*, Arthi Senthilkumar
Downie Stewart FULLER SCHOLARSHIPS/ SJWRI DCLINDENT RESEARCH GRANTS	<i>The effect of posterior bite raising by clear aligners on habitual activity of the masticatory muscles</i>	1 Dec 22 - 30 Nov 24	\$4,995	<b>Mauro Farella</b> , Fiona Firth, Allen Hu*
International College of Prosthodontists	<i>An in vitro study of the effect of various titanium surface treatments and simulated ageing process on the bonding between zirconia implant crowns and titanium bases</i>	1 Dec 22 - 31 Jul 23	\$6,349	<b>Sunyoung Ma</b>
New Zealand Institute of Dental Technologists	<i>Dental Technology Research for 2023</i>	1 Dec 22 - 30 Nov 23	\$16,710	<b>Joanne Choi</b>



## Postgraduate research degree graduands

### Doctor of Philosophy (PhD) graduands, 2021-2022

Listed by graduation date

Student	Advisors (primary listed first)	Thesis title	Graduated
<b>Shaikhah Alsamahi</b>	A/Prof Lara Friedlander A/Prof Haizal Hussaini Prof. Alison Rich Dr Trudy Milne	<i>Type 2 diabetes and the dental pulp</i>	May 2021
<b>Ye Naung</b>	Prof Warwick Duncan A/Prof Dawn Coates A/Prof Rohana De Silva	<i>Palatal periosteum-derived Mesenchymal stem cells in osteogenesis</i>	May 2021
<b>Yasmeen Ruma</b>	A/Prof Brian Monk Dr. Mikhail Keniya Prof Joel Tyndall	<i>Development of <i>Cryptococcus neoformans</i> and <i>Candida parapsilosis</i> lanosterol 14<math>\alpha</math>-demethylase (CYP51) as drug targets</i>	Aug 2021
<b>Mohammad Aziz</b>	Prof Alison Rich A/Prof Haizal Hussaini Prof Marilyn Hibma Dr Benedict Seo	<i>Exploration of exosomes as potential biomarkers for oral cancers</i>	Dec 2021
<b>Dorothy Boyd</b>	Prof Murray Thomson A/Prof Susan Moffat	<i>Outcomes of restorative dental treatment with the Hall technique in New Zealand primary care</i>	May 2022
<b>Parham Hosseini</b>	A/Prof Brian Monk Dr Mikhail Keniya Prof Joel Tyndall	<i>Analysis of <i>Aspergillus fumigatus</i> CYP51 isoforms as drug targets</i>	Aug 2022
<b>Hisham Mohammed</b>	Prof Mauro Farella Prof Jamin Halberstadt Prof Ben Daniel Motidyang	<i>Impact of malocclusion on smiling features</i>	Dec 2022

### Doctor of Clinical Dentistry (DClinDent) graduands, 2021-2022

Listed by graduation date, then by clinical discipline

Student	Advisors (primary listed first)	Thesis Title	Discipline	Graduated
<b>Gabrielle Hunt</b>	A/Prof Lara Friedlander Prof Nicholas Chandler Prof Ben Daniel Motidyang	<i>Students' perceptions of undergraduate endodontic education and the impact of the covid-19 pandemic in New Zealand</i>	Endodontics	Dec 2021
<b>David Yong</b>	A/Prof Peter Cathro Dr Jithendra Ratnayake Prof George Dias Prof Paul Cooper Dr Joanne Choi	<i>Development and analysis of a novel bovine hydroxyapatite calcium silicate cement for conservative pulp therapy</i>	Endodontics	Dec 2021
<b>Reginald Kumar</b>	Prof Mauro Farella Dr Fiona Firth Prof Jamin Halberstadt	<i>What's in a Smile? An investigation of the effect of ethnic background on smiling features</i>	Orthodontics	Dec 2021
<b>Marguerite Paterson</b>	Dr Fiona Firth Prof Mauro Farella Dr Trudy Milne	<i>Modulation of osteoblasts and periodontal ligament cells by IL-17 and IL-6</i>	Orthodontics	Dec 2021

Student	Advisors (primary listed first)	Thesis Title	Discipline	Graduated
Michael Skilbeck	A/Prof Li Mei Prof Mauro Farella Prof Richard Cannon	<i>Surface modification of orthodontic elastomers to overcome biofilm formation</i>	Orthodontics	Dec 2021
Julia Smith	Prof Mauro Farella Dr Austin Kang	<i>Predictability of lower incisor root tip with the invisalign appliance</i>	Orthodontics	Dec 2021
Mohamed Shafiq Abdul Aziz	A/Prof Mani Ekambaram Dr Carolina Loch A/Prof Alison Meldrum	<i>Changes in mineral density and nonomechanical properties of enamel white spot lesions by dentifrices with different active ingredients for remineralisation</i>	Paediatric Dentistry	Dec 2021
Yu-Lynn Lee	A/Prof Mani Ekambaram Dr Dorothy Boyd Dr Kai Li	<i>Bonding universal dental adhesive to developmentally hypomineralised enamel</i>	Paediatric Dentistry	Dec 2021
Suneil Nath	A/Prof Mani Ekambaram Dr Niv Kamalendran Dr Kai Li	<i>Biomimetic remineralisation: A comparative evaluation of the enamel remineralisation potential of a short, medium, and long chain self-assembling peptide</i>	Paediatric Dentistry	Dec 2021
Zeina Al Naasan	Prof Jonathan Broadbent Dr Moira Smith Prof Warwick Duncan	<i>Community based oral health promotion among adult Syrian former refugees resettled in Dunedin, New Zealand</i>	Periodontology	Dec 2021
Anthony Kao	Prof Andrew Tawse-Smith Prof Warwick Duncan A/Prof Sunyoung Ma Dr Malcolm Reid	<i>Effect of mechanical decontamination procedures on moderately roughened titanium surfaces: quantity and size of the titanium particulate released by mechanical instrumentation</i>	Periodontology	Dec 2021
Abdelrahman Badarneh	Prof Karl Lyons Dr Kai Li Prof Neil Waddell Dr Joanne Choi	<i>The effect of aging on the wear performance of monolithic zirconia</i>	Prosthodontics	Dec 2021
Arthi Senthilkumar	Prof Paul Brunton Prof Karl Lyons Mr Ian Crabtree	<i>Investigating the adequacy of oral health care knowledge content for the geriatric patient in the undergraduate nursing programme in New Zealand</i>	Prosthodontics	Dec 2021
Raj Singh	Prof Neil Waddell Dr Kai Li Prof Karl Lyons	<i>Effect of two brands of glaze material on the flexural strength of high translucent monolithic zirconia</i>	Prosthodontics	Dec 2021
Ceridwen Benn	Mr Graeme Ting Dr Ari Samaranayaka	<i>Promoting oral health in pregnancy. Exploring the needs of lead maternity care midwives</i>	Special Needs Dentistry	Dec 2021
Emma Jefferies	Graeme Ting Prof Murray Thomson	<i>Oral health and oral-health-related quality of life of a group of young adults using mental health services in Christchurch</i>	Special Needs Dentistry	Dec 2021
Mohd Mohamed Ashri	Mr Graeme Ting Prof Darryl Tong	<i>Perceived confidence in performing peripheral venipuncture among dental practitioners in New Zealand and Malaysia</i>	Special Needs Dentistry	Dec 2021



Student	Advisors (primary listed first)	Thesis Title	Discipline	Graduated
Manori Rupasinghe	Mr Graeme Ting Prof Murray Thomson Prof Darryl Tong	<i>Oncology and dentistry: a regional hospital perspective</i>	Special Needs Dentistry	Dec 2021
Sherry Lee	Dr Fiona Firth Prof Ben Daniel Motidyang Prof Mauro Farella A/Prof Li Mei	<i>Patients' experiences with orthodontic treatment through traditional fixed appliances, clear aligners and direct-to-consumer clear aligners: a qualitative study</i>	Orthodontics	Dec 2022
Beatrice Ng	Dr Moira Smith Dr Ari Samaranayaka	<i>Acceptability and feasibility of teledentistry use in aged residential care facilities in the Otago region of New Zealand</i>	Special Needs Dentistry	Dec 2022
Khac Thuong Nguyen	A/Prof Li Mei Prof Mauro Farella A/Prof Vincent Bennani	<i>Stereophotogrammetric analysis of lip changes induced by simulated incisor protraction</i>	Orthodontics	Dec 2022
Nicholas Pittar	Prof Mauro Farella Dr Fiona Firth	<i>Effect of passive clear aligners on masticatory muscle activity in adults with and without high oral parafunction</i>	Orthodontics	Dec 2022
Jesslyn Praganta	A/Prof Harsha De Silva Prof Murray Thomson A/Prof Rohana De Silva Prof Darryl Tong	<i>Clinical effects of advanced platelet-rich fibrin (A-PRF) on the outcomes of third molar removal surgery: A randomised controlled trial</i>	Oral Surgery	Dec 2022
Nigel Tan	Prof Darryl Tong Prof Murray Thomson A/Prof Harsha De Silva A/Prof Rohana De Silva	<i>A comparison between knotless and conventional sutures: A novel approach to third molar surgery</i>	Oral Surgery	Dec 2022
Sunethra Tennekoon	Dr Kai Li Dr Simon Guan	<i>Analysis of changes in saliva composition in patients with oral cancer and oropharyngeal cancer using Fourier transform infrared spectroscopy</i>	Special Needs Dentistry	Dec 2022

## Masters graduands, 2021-2022

Listed by graduation date, then by degree programme

Student	Advisors (Primary listed first)	Thesis Title	Programme	Graduated
Yunsun Choi	A/Prof Susan Moffat A/Prof Alison Meldrum	<i>The work experiences of a cohort of New Zealand oral health therapist</i>	MOH	Aug 2021
Ya-Shiuan Chuang	A/Prof Vincent Bennani John Aarts Prof Paul Brunton	<i>The Effectiveness and Side Effects on Periodontal Health of Gingival Retraction Cord versus Retraction Paste: A Systematic Review</i>	MDent (Aesthetic Dentistry)	Dec 2021
Varsha Jeyaprakash	A/Prof Vincent Bennani John Aarts Prof Paul Brunton	<i>Assessment of hue, chroma and value in visual and instrumental methods of tooth shade selection: A systematic review</i>	MDent (Aesthetic Dentistry)	Dec 2021

Student	Advisors (Primary listed first)	Thesis Title	Programme	Graduated
Peter Sese	Prof Murray Thomson Prof Darryl Tong Faumuina Prof Tai Sopoaga	<i>Self-reported oral health, dental anxiety and use of services in a young Pacific sample</i>	MDent (Rural Oral Health Care)	Dec 2021
Hayley Bichan	A/Prof Susan Moffat Dr Lee Adam	<i>The work experiences of New Zealand dental therapists registered in the Adult Care in Dental Therapy practice scope</i>	MOH	Aug 2022
Anuj Arora	A/Prof Vincent Bennani John Aarts Prof Paul Brunton Dr Jithendra Ratnayake	<i>Effectiveness of Bonding on the Success of Zirconia Resin Bonded Bridges: A Systematic Review</i>	MDent (Aesthetic Dentistry)	Dec 2022
Jacy Lin	A/Prof Vincent Bennani John Aarts Prof Paul Brunton Dr Jithendra Ratnayake	<i>Factors influencing success rate of ceramic veneers on non-vital anterior teeth: A Systematic Review</i>	MDent (Aesthetic Dentistry)	Dec 2022
Vaibhav Talesara	A/Prof Vincent Bennani John Aarts Prof Paul Brunton Dr Jithendra Ratnayake	<i>Accuracy of digitally coded healing abutments: A systematic review</i>	MDent (Aesthetic Dentistry)	Dec 2022
Manisha Narsinh	Prof Murray Thomson Prof Jonathan Broadbent	<i>Dental treatment for children under general anaesthetic in Auckland 2007-2019</i>	MComDent	Dec 2022

**MComDent** Master of Community Dentistry

**MDent** Master of Dentistry

**MOH** Master of Oral Health



## Thesis research abstracts, 2021-2022

*Abstracts of postgraduate research theses from SJWRI / Faculty of Dentistry candidates published in 2021 and 2022. Abstracts listed by degree, then by publication year. Data extracted from [ourarchive.otago.ac.nz](http://ourarchive.otago.ac.nz).*

### Doctor of Philosophy (PhD) abstracts

#### 2021

##### Mohammad Aziz

Aziz, M. A. (2021). Exploration of exosomes as potential biomarkers for oral cancers

*Advisors: Rich, Alison; Seo, Benedict; Hussaini, Haizal Muhammad; Hibma, Merilyn*

*Keywords: FOXM1; Saliva; Cancer; Biomarkers; Diagnostics; Diagnosis; Plasma; Ultracentrifugation; OSCC; Exosome*

<http://hdl.handle.net/10523/12197>

Exosomes are membrane-bound nanovesicles released by cells into their extracellular environment via fusion of the multivesicular endosome with the plasma membrane. These cell-derived vesicles are present in numerous body fluids, including blood, saliva, urine and lymph, under healthy and pathological conditions. They play a crucial role in cell-to-cell communication by virtue of the exchange of their contents which include proteins, lipids and nucleic acids. The contents can be transferred from one cell to another, including transfer from normal to cancer cells and between cancer cells that can lead to transcriptional and translational changes in the recipient cell. The contents of exosomes are influenced by various physiological and pathological stimuli received by the parent cell. Exosomal contents may thus provide a valuable source for screening and early detection of cancer, as well as monitoring cancer progression and interventions.

The management of patients with oral cancer is a tremendous worldwide liability. Despite significant efforts, the worldwide five-year relative survival rate from oral cancer is generally less than 50%. This low survival rate has remained unchanged for more than three decades. Early diagnosis of oral cancer is associated with improved survival; however, the invasive nature, technical requirements and skill required to perform intra-oral biopsies limits their usefulness as a part of community oral cancer screening. The use of saliva-based diagnostic testing to assess the presence of established salivary biomarkers would be advantageous if it could be

shown to be a reliable method to detect early-stage tumours and identify high-risk patients. Saliva is a thick fluid that is 98% water, and the remaining 2% contains proteins, potentially including salivary biomarkers that have diagnostic potential. There have been various advances in saliva analysis, but to date, no saliva-based oral cancer diagnostic tests have made it to the market. The discovery of exosomes in saliva has provided a pathway to detect oncogenic biomarkers protected within salivary exosomes. If we can show that salivary exosomes are a reliable and effective method for detecting oral cancer biomarkers, potentially saliva can be used to develop a non-invasive oral cancer diagnostic test to run community screening programs.

The aim of this study was to isolate exosomes and assess the expression of genes of interest (GOI) *FOXM1*, *HOXA7*, *CCNB1*, *DNMT1* and *HSPA1A* genes and *FOXM1*, *DNMT1* and *HSP70* proteins of interest (POI) in exosomes, both *in vitro*, using oral squamous cell carcinoma (OSCC) and normal primary gingival keratinocyte (PKG) cell lines and *ex vivo*, in exosomes derived from plasma and saliva samples from OSCC patients and healthy controls. The oncogenes and oncoproteins selected for this study had been documented previously to be overexpressed in oral cancers. The hypothesis tested was that *FOXM1*, *HOXA7*, *CCNB1*, *DNMT1* and *HSPA1* genes and *FOXM1*, *DNMT1* and *HSP70* proteins would be highly expressed in exosomes derived from OSCC patients in comparison with healthy controls.

A major hurdle in studying exosomes is their isolation. Their small size and the fact that they do not have any specific surface protein markers make them difficult to isolate. Thus, this research initially looked into determining and optimising a method to isolate exosomes, which was both cost-effective and yielded enough exosomes for downstream analysis. An Exoquick-TC plus exosome isolation kit (kit) was compared with the classic ultracentrifugation (UC) method for exosome isolation from the concentrated cell-conditioned medium of a representative OSCC cell line (SCC-4). Cryo-Electron Microscopy (Cryo-EM) showed vesicles were delimited by a bilayered membrane and had either a round or slightly elongated shape with diameters ranging between 50 and 150nm in samples obtained using both methods. Dynamic light scattering resulted in multiple peaks for kit exosomes, whereas a single peak was observed for UC exosomes. The multiple peaks most likely came from proteins co-precipitating with exosomes. A significantly higher total RNA was observed in UC exosomes in contrast to kit exosomes ( $P < 0.0001$ ). This was reflected in subsequent mRNA analysis using quantitative polymerase chain reaction (qPCR), where UC exosomes had lower cycle threshold (Ct) values compared to kit exosomes. UC proved a better option and was used for exosome isolation for all subsequent experiments.

The presence of the GOI and POI were evaluated using the concentrated cell-conditioned medium of normal oral keratinocyte (PGK) and SCC-4 and SCC-25 cell lines. The results showed a significantly higher expression level of all the GOI in exosomes derived from SCC-4 and SCC-25 exosomes than PGK exosomes. The POI results suggested a higher expression of all POI in SCC-4, and DNMT1 and HSP70 in SCC-25 exosomes when compared with cells. Even though their expression was lower in SCC-4 and SCC-25 cells compared to PGK cells, DNMT1 and HSP70 were highly expressed in SCC-4 and SCC-25 exosomes compared to PGK exosomes implying that the cells preferentially package certain proteins for transport via exosomes to recipient cells.

The selected GOI and POI were then further evaluated in exosomes derived from blood plasma and saliva of OSCC patients compared with healthy controls. Due to the low quantity of total RNA, only *HSPA1A* and housekeeping genes were detected in plasma and saliva exosome samples despite adding a preamplification step. The mean expression level of *HSPA1A* was higher in both OSCC plasma and saliva exosomes compared to controls. Enzyme linked immunosorbent assay (ELISA) results showed a higher expression of FOXM1, DNMT1 and CCNB1 in OSCC plasma exosomes than controls. There was a marginally lower expression of HSP70 in OSCC plasma exosomes. A similar trend was observed in OSCC saliva exosomes for FOXM1, DNMT1 and HSP70, whereas a lower expression level of CCNB1 was observed in OSCC saliva exosomes compared to controls. Even though a majority of the GOI and POI were overexpressed in OSCC samples, due to the small sample size and a high variation in expression levels between samples, the differences of the means were not statistically significant except for FOXM1 protein, which was significantly higher in OSCC plasma.

This is the first study, to the best of my knowledge, which has shown a similar trend of expression of biomarkers in exosomes in both saliva and plasma. It was also observed that despite having less total RNA and total proteins, a higher expression of the GOI and POI was observed in salivary exosomes compared to plasma exosomes. It is thus proposed that saliva may be a suitable alternative to blood in the future for the detection of disease biomarkers. The results also provide the first evidence that the selected proteins were detected and quantified in exosomes using ELISA. This suggests a change of focus from mRNAs to proteins since they are more stable and easier to detect and quantify. While more precise exosome isolation methods are still underway, it was shown that saliva exosomes are very important for future research and potential clinical application as they carry genes and proteins in greater quantities when compared with plasma exosomes.

## Yasmeen Ruma

Ruma, Y. N. (2021). Development of *Cryptococcus neoformans* and *Candida parapsilosis* lanosterol 14 $\alpha$ -demethylase (CYP51) as drug targets

Advisors: Monk, Brian; Keniya, Mikhail; Tyndall, Joel

Keywords: fungal pathogen; lanosterol 14 $\alpha$ -demethylase; fungal infection; Antifungal resistance; Azole drugs; lanosterol 14 $\alpha$ -demethylase; *Cryptococcus neoformans*; *Candida parapsilosis*; *Saccharomyces cerevisiae* expression; Cytochrome P450

<http://hdl.handle.net/10523/12104>

Fungal infections afflict the well-being of a broad cross-section of the human population. These infections can be either superficial or invasive. While superficial infections may be readily treated, invasive fungal infections (IFIs) can be lethal. *Cryptococcus neoformans* and *Candida parapsilosis* are two emerging opportunistic fungal pathogens that cause IFIs in humans, especially in individuals with immunocompromised disease such as AIDS or have undergone surgical condition such as organ transplantation. *C. neoformans* causes lifethreatening cryptococcal meningitis in HIV infected patients while *C. parapsilosis* is a commensal and causes candidiasis by transmission through the hands of health workers in the hospital environment.

Azole antifungals are usually the first line drugs of choice for such infections. This class of drugs act by inhibiting lanosterol 14 $\alpha$ -demethylase (CYP51), a rate limiting enzyme essential for the synthesis of the fungal-specific sterol ergosterol. Azole prophylaxis and/or long-term use of azole drugs have however led to the acquisition of azole resistance among these pathogens. Discovery of new drugs to combat the azole resistance is of utmost importance. The redox partner of CYP51 is NADPH-cytochrome P450 reductase (CPR), which provides electrons for CYP51 activity. As a part of an approach to structure-directed drug discovery, this project aims to assess the function, azole susceptibility, biochemistry and structural features of CYP51s from the fungal pathogens *C. neoformans* and *C. parapsilosis* and the impact of their cognate CPR by using a *Saccharomyces cerevisiae* host system.

Recombinant full-length, codon optimised and C-terminal hexa-histidine tagged CYP51s of *C. neoformans* (CnCYP51), *C. parapsilosis* (CpCYP51) and the CpCYP51 Y132F mutant were constitutively overexpressed from the PDR5 locus of a *S. cerevisiae* host strain deleted of 7 drug efflux pumps and with the promoter of the native CYP51 gene replaced by a galactose-regulated promoter (GAL1). A cognate NADPH-cytochrome P450 reductase (CPR) was constitutively co-expressed from the PDR15 locus of the CYP51 expressing



recombinant strains. Agarose diffusion assays and measurement of minimum inhibitory concentrations (MIC80) in liquid microdilution assays were used to evaluate the susceptibility of the *S. cerevisiae* host and recombinant strains to various short-tailed (fluconazole, voriconazole) and long-tailed (itraconazole, posaconazole) triazoles, medium-tailed tetrazoles (VT-1161, VT-1129) and an experimental tetrazole MCC-8186, during growth on complex synthetic medium containing glucose. The glucan synthase inhibitor micafungin and the polyene amphotericin B were used as control drugs. Crude membranes of CnCYP51-6 His, CpCYP51-6 His and CpCYP51-6 His Y132F expressing recombinant strains were used to analyse the expression levels of these proteins by SDS-PAGE and western blot analysis. The recombinant proteins were solubilised from the crude membranes using the detergent n-decyl- $\beta$ -D-maltoside followed by purification by nickel affinity and size exclusion chromatography. Purified proteins were used to study the Type I binding of their substrates (lanosterol and eburicol) and Type II binding of azoles (posaconazole and voriconazole) to these proteins. Affinity purified CPRs from co-expressing strains were used to assess their function by the cytochrome c reduction activity. Crystallisation of the proteins with the triazoles posaconazole and voriconazole was attempted using the hanging-drop vapour diffusion method.

CnCYP51, CpCYP51 and CpCYP51 Y132F expressed from the PDR5 locus supported growth in the presence of either galactose or glucose (native ScCYP51 suppressed) and showed functional activity that was inhibited by azole drugs in tests using agarose diffusion assays and microdilution assays. In case of CnCYP51 expressing strains, co-overexpression of the cognate reductase CnCPR showed reduced susceptibility to the short-tailed azoles fluconazole and voriconazole by 2 to 4-fold, respectively, but not to the long-tailed triazoles or tetrazoles. A slight reduction in susceptibility to amphotericin B was also induced by CnCPR co-expression. For the *C. parapsilosis* CYP51 expressing strains, constitutive expression in yeast of CpCYP51 Y132F conferred a 10 to 12-fold resistance to fluconazole and voriconazole, ~6-fold resistance to VT-1161 and VT-1129, and reduced to a 3-fold resistance to MCC-8186, but did not confer resistance to the long-tailed triazoles. Coexpression of CpCPR did not cause any change in the susceptibility of recombinant strains expressing CpCYP51 or its Y132F mutant to the azole drugs. Each of the purified proteins showed spectral characteristics typical of CYP51s. Type I binding assays revealed that the purified CnCYP51 bound preferentially eburicol compared to lanosterol, while CpCYP51 bound both. Both voriconazole and posaconazole bound to the purified CnCYP51 producing the characteristic Type II binding spectra. Cytochrome c reduction activity of the CPRs was detected as a 550 nm peak. Protein crystals were

obtained for only the wild type CpCYP51 in complex with posaconazole at pH 8.2 and 8.3 with 44% PEG 400 in 100 mM glycine-NaOH buffer, but these did not diffract under X-ray exposure.

Structural and functional analysis of recombinant CYP51s from the fungal pathogens *C. neoformans* and *C. parapsilosis* has improved the understanding of their susceptibility to azole drugs and will help advance structure-directed antifungal discovery.

2022

Dorothy Boyd

Boyd, D. H. (2022). Outcomes of restorative dental treatment with the Hall technique in New Zealand primary care

Advisors: Thomson, W Murray; Moffat, Susan M

Keywords: Hall technique; primary oral healthcare; procedural pain; clinical outcomes; primary care; stainless steel crown; child; children; carious lesion management; New Zealand; child assent; caregiver consent; randomised control trial; feasibility study; dental treatment; dental anxiety

<http://hdl.handle.net/10523/12814>

Background: The Hall technique (HT) for placing stainless steel crowns is an approach to primary molar carious lesion management in which the lesion is sealed in rather than surgically excised. Overseas studies of the HT used by dentists showed better success rates than conventional restorations, and one study indicated that children preferred the HT to conventional restorations.

Aims and Objectives: The aim of this thesis was to research the use of the HT in New Zealand (NZ) primary care. The objectives were: (1) to test research methods, assess the training in, acceptability of, and outcomes of the HT in the hands of dental therapists in primary care in a feasibility study, and to compare the clinical outcomes with those of conventional restorative treatment; (2) to compare the clinical outcomes of the HT and conventional restorative treatment in a large randomised control trial (RCT); (3) to evaluate the consent process involved in a dental RCT; and (4) to evaluate clinical outcomes of the HT and conventional SSC in a RCT, and children's procedural pain experiences with these different treatments.

Methods: Three clinical trials took place, all in the NZ primary care setting, with dental therapists (DTs) providing treatment to children between three and eight years of age. The first was a feasibility study with

an interventional (quasi-experimental) design and two-year follow-up; this was followed by two RCTs with two-year and 18-month follow-ups, respectively. Evaluation of the consent process in the final RCT used mixed quantitative and qualitative methods, with one-to-one telephone interviews with caregivers of children taking part in the RCT, and analysis with an inductive approach.

**Results:** DTs who had the appropriate training were adept at the HT and accepted it. A successful outcome was recorded significantly more in teeth treated with SSCs, regardless of whether these had been placed using a conventional approach or using the HT, and glass ionomer cement restorations (GIC) performed poorly. Moderate and severe procedural pain was reported by as many children when they had treatment with the HT as when they had a conventional SSC; dental anxiety scores did not predict the children who reported moderate or severe procedural pain. Gaining caregivers' informed consent for their child to participate in a randomised control trial was a complex undertaking, and the informed consent process was not always effective, despite the consent documents having high readability.

**Conclusions:** There are much lower retreatment rates for children with carious primary molars treated with the HT than with conventional GIC restorations. SSCs placed with the HT have similar success rates to SSCs placed conventionally. The lack of a difference in self-reported procedural pain between HT and conventional SSC compromises the child-friendliness of the HT, and, to improve children's experiences, further research is required on using comfort management strategies, and on preventing dental caries. Pre-testing RCT consent documentation within the population to be studied is recommended to enhance the consent process. Further research on children's understanding of their participation in a RCT is required.

## Parham Hosseini

Hosseini, P. (2022). Analysis of *Aspergillus fumigatus* CYP51 isoforms as drug targets

**Advisors:** Monk, Brian; Keniya, Mikhail; Tyndall, Joel

**Keywords:** *Aspergillus fumigatus*; CYP51; ERG11; *Saccharomyces*

<http://hdl.handle.net/10523/12905>

Invasive aspergillosis is mainly caused by the fungal pathogen *Aspergillus fumigatus*. This type of infection affects approximately 15% of allogeneic transplant patients, with mortality rates ranging from 40% to 90%. Treatments for aspergillosis rely heavily on triazole drugs but *A. fumigatus* is intrinsically

resistant to fluconazole (FLC). Instead, voriconazole (VCZ) has emerged as the preferred antifungal used to treat *Aspergillus* infections. Despite widespread clinical application, VCZ primary treatment of invasive aspergillosis results in therapeutic failure for a significant proportion of patients. This scenario poses some important experimental questions. How is intrinsic FLC resistance in *A. fumigatus* conferred and how does a particular set of mutations confer acquired VCZ resistance at the molecular level? Both problems have been addressed by separately expressing in a *Saccharomyces cerevisiae* system the two isoforms of *A. fumigatus* sterol 14 $\alpha$ -demethylase (AfCYP51A and AfCYP51B) as recombinant full-length functional enzymes together with the cognate NADPH-cytochrome P450 cognate reductase AfCPRA2, and a sterol C24-methyl-transferase AfERG6 that synthesises eburicol from lanosterol. Replacement of ScErg11 with the AfErg6 gene also excluded interference by the native enzyme in assessment of the activity of AfCYP51 isoforms. A requirement for co-expression of AfERG6 with AfCYP51A and AfCYP51B in *S. cerevisiae* indicated that AfCYP51 enzymes require eburicol but not lanosterol as a substrate. Single amino acid mutations Y121F, T289A, I301T, and the double mutation Y121F T289A in AfCYP51A were used to investigate the interaction of azole drugs with key amino acid residues in the active site of the enzyme. The susceptibility of the *S. cerevisiae* host and recombinant strains to azole drugs were assessed using agarose diffusion assays and measurement of minimum inhibitory concentrations (MIC80) in liquid microdilution assays. Affinity purified recombinant AfCYP51A and AfCYP51B proteins were used to investigate Type I binding of substrates and Type II binding of selected azoles. Azole susceptibility measurements confirmed both AfCYP51A and AfCYP51B are functional in the host system and indicated AfCYP51A but not CYP51B confers high-level resistance to FLC. Compared to AfCYP51B and *S. cerevisiae* ERG11, AfCYP51A provided high level resistance to DCZ and VCZ, weaker resistance to VT-1161, but retained susceptibility to PCZ. Type II binding assays gave affinities consistent with the azole susceptibility experiments. Azole susceptibility measurements also showed AfCYP51A T289A conferred 4-fold and 11-fold greater susceptibility to FLC than AfCYP51A I301 and AfCYP51A, respectively. Homology modelling of AfCYP51A suggests that the proximity and polarity of T289 in helix I is likely to interfere with the binding of FLC in the active site, with I301 is located too distant from FLC to interact with it directly. Azole susceptibility experiments showed that the AfCYP51A Y121F plus T289A mutations were required to confer increased resistance to VCZ. These results are consistent with ScERG11 crystal structures showing a water-mediated hydrogen bond network involving the hydroxyl group of Y140 (structurally aligned with Y121 in AfCYP51A), the heme ring D

propionate, and the ligand's tertiary alcohol group affects the binding of FLC, VCZ, and VT-1161 (but not PCZ). This network was overridden by the effect of T289. Functional expression of AfCYP51A and AfCYP51B in yeast and the modelling of AfCYP51A mutations increase understanding of intrinsic resistance of *A. fumigatus* to FLC and give insight into acquired resistance to short-tailed azole drugs. The recombinant strains enable systematic investigation of the susceptibility of AfCYP51 isoforms to existing azole drugs and aid the discovery of novel antifungals effective against the major fungal pathogen *A. fumigatus*.

### Hisham Mohammed

Mohammed, H. M. Y. A. (2022). *Impact of malocclusion on smiling features*

*Advisors: Farella, Mauro; Halberstadt, Jamin; Daniel, Ben*

*Keywords: Aesthetics; Artificial Intelligence; Facial Action Coding System; Malocclusion; Meta-synthesis; Orthodontics; Smiling; Validation studies*

<http://hdl.handle.net/10523/13686>

This doctoral project is presented in a hybrid format where publishable material are structured as distinct thesis chapters. Five main chapters discuss smiling from different dimensions in the context of the respective orthodontic patient.

*CHAPTER 1 – A qualitative meta-synthesis of research into patients' past experiences and perceptions of orthodontic treatment outcomes*

The introductory chapter to the present work. A review and synthesis of past research into orthodontic patients' experiences with treatment and some important factors influencing their perception of their achieved outcomes. Highlights within this chapter suggest that smiling is centrally placed and is of due importance to the orthodontic patient.

*CHAPTER 2 – What's in a smile? A literature review*

A literature review overlying the general physiologic and anatomical aspects of smiles. It discusses factors affecting the propensity towards smiling and different methods utilised in smile analysis. Based on these points, literature gaps – especially in relation to oral health and orthodontics – could be identified, building a premise for the development of the later chapters.

*CHAPTER 3 – Automated detection of smiles*

A presentation of the development and validation of a pattern-recognition algorithm for smiles. An overview of the implemented methods is detailed. Also, subsequent results of its validation on a representative sample of participants are represented.

The final part of this chapter presents a discussion around the developmental and validation phases and ends with the overall conclusions.

*CHAPTER 4 – Malocclusion severity and features of smile: is there an association?*

This is a core dissertation chapter and a continuation to the work presented within the previous chapters. It presents an observational study aiming to understand whether an association exists between malocclusion severity and different smile features based on automated smile detection and analysis algorithms. The observational design, implemented methods, results, discussion and conclusions are all presented in orderly fashion detailing different aspects of this chapter.

*CHAPTER 5 – General discussion and future directions*

A chapter that provides a general commentary relating all previous chapters. It discusses expectations from prospective research into this particular stream and provides future directions. In addition, it presents different challenges encountered with Covid-19 during the overall doctoral project.

### Aida Ngah

Ngah, Nurul Aida Binti (2022) *Collagen-bioglass-lyophilised platelet rich-fibrin scaffold for craniofacial regeneration*

*Advisors: Mohd Hussaini, Haizal; Dias, George; Tong, Darryl*

*Keywords: bone; scaffold; tissue; engineering; craniofacial; cleft; alveolar*

<http://hdl.handle.net/10523/13503>

Congenital birth defects, trauma, inflammation, and cancer surgery are the main causes of craniofacial deformities. Cleft lip and palate (CLP) contribute to the most common craniofacial birth defects. Platelet-rich fibrin (PRF) is recognised in craniofacial surgery for providing essential autologous growth factors (GF) required for bone regeneration. However, its low elastic modulus, poor storage potential, and limitations in emergency therapy cause its short-term clinical application, thus restricting the use of PRF for broader clinical applications.

Lyophilised PRF (LyPRF) has demonstrated superior storage and transport capabilities, greater tissue compatibility, and osteogenic regenerative potential. This thesis aimed to develop and characterise a novel three-dimensional (3D) bone substitute using collagen, bioglass and LyPRF (C-BG-LyPRF) scaffold and assess its biocompatibility for potential applications in craniofacial tissue engineering and regeneration.

Ethical approval for this study was obtained from the University of Otago Human Ethics Committee (Health) and consultation with Māori has been undertaken with the Ngāi Tahu Research Consultation Committee. PRF was prepared from venous blood obtained from healthy volunteers according to Choukroun's protocol. To prepare LyPRF, a fresh PRF was frozen and stored at -80°C for 30 minutes before being freeze-dried overnight. After being ground into granules with a mortar and pestle, LyPRF granules were combined with collagen and bioglass to construct the C-BG-LyPRF scaffold. Following that, the C-BG-LyPRF scaffold was characterised based on physicochemical and biological evaluations. In addition, the biomimetic apatite formation on the C-BG-LyPRF scaffold after immersion in simulated body fluid (SBF) was examined to ascertain the scaffold's bioactivity qualities. This is accomplished by determining and characterising the formation of a hydroxyapatite layer on the C-BG-LyPRF scaffold following immersion in the SBF. *In vitro* studies using MC3T3-E1 cells were conducted to assess the biocompatibility and differentiation potential of the C-BG-LyPRF scaffold. This cell line was chosen because it has been extensively used to assess the *in vitro* regeneration of craniofacial bone.

The findings of this study showed that LyPRF demonstrated versatility as a potential biomaterial for a growth factor reservoir, as well as a potential craniofacial bioscaffold. The CBG-LyPRF scaffold revealed an interconnected pore system with an average pore diameter of 146 µm and fell within the acceptable bone scaffold porosity of 87.26%. Fourier-transform-infrared-spectroscopy (FTIR) spectra confirmed the presence of amide I, amide II, and amide III functional groups in the C-BG-LyPRF scaffold. Energy-dispersive X-ray analysis (EDX) showed that the inorganic phase of the C-BG-LyPRF scaffold was composed of sodium, silicon, calcium, phosphorous, chlorine, and sulphur. The X-Ray Diffraction (XRD) pattern confirmed the crystalline appearance of the C-BG-LyPRF scaffold. The C-BG-LyPRF scaffold demonstrated a swelling rate of 157% at 50 minutes and a sustained release of PDGF-AB delivery for approximately 28 days. Furthermore, the apatite formation on the C-BG-LyPRF scaffold's surface after immersion in SBF demonstrated superior physical and chemical properties compared to the control groups based on Scanning Electron Microscopy (SEM), XRD, FTIR, and EDX analyses. The apatite phase formed on the C-BG-LyPRF scaffold's surface was also comparable to the hydroxyapatite phase observed in natural bone.

Furthermore, C-BG-LyPRF scaffold extract medium was found to be biocompatible with MC3T3-E1 cells in both the Live/Dead and proliferation assays. The differentiation of MC3T3-E1 cells was supported by the observation of mineralised nodules and bone matrix protein by Alkaline Phosphatase (ALP),

Alizarin Red S Staining (ARS), and Osteocalcin (OCN) ELISA Assays. It is critical to highlight that, when compared to other control groups, the C-BG-LyPRF scaffold extract medium exhibited the strongest mineralisation potential as determined by ARS staining, ALP, and OCN assays.

In summary, the aforementioned results demonstrate the C-BG-LyPRF scaffold's exceptional biocompatibility and regenerative potential, establishing it as a promising biomaterial for craniofacial tissue engineering

### Mina Rajabi

Rajabi, M. (2022). Chitosan-based 3D-printing scaffolds for bone tissue engineering

*Advisors: Ali, Azam; Cabral, Jaydee; Saunderson, Sarah*

*Keywords: 3D-printing; tissue-engineering; hydrogels; chitosan; bioengineering; poly(ethyleneglycol)diacrylate; pluronic; manufacturing; scaffold*

<http://hdl.handle.net/10523/14680>

With the rapid progress of 3D-printing, this emerging technology is anticipated to revolutionise the biomedical industry in the near future. However, the low shape-fidelity of natural-based inks and the low biological performance of synthetic-based inks remarkably limits the number of potential inks for 3D-printing of bioengineered constructs. Therefore, it is increasingly important to develop cost-effective and efficient inks with high degrees of printability and biocompatibility to fabricate bioartificial scaffolds equivalent to human organs to ultimately solve the organ transplant problem. This dissertation reports on the efforts to fill this gap by developing new functional hydrogel inks to 3D print bone tissue-engineered scaffolds. Two hydrogel inks based on either chitooligosaccharide (COS) or hydroxyapatite (HA) were developed for extrusion-based 3D-printing. Bone tissue was selected as the target tissue because in the event of excessive damage to the bone tissue, the self-healing process alone is not sufficient to restore the bone integrity in the lifetime of a patient.

Chitosan, being biocompatible, biodegradable and antimicrobial, has been immensely utilised in the field of biomedical sciences. Consequently, chitosan-based hydrogels hold great promise for developing 3D-printing inks. However, low water solubility at neutral pH and poor mechanical integrity are the main issues associated with using chitosan in regenerative medicine. To overcome the limitations of existing chitosan, COS was prepared by partial acidic hydrolysis of unstable glycosidic bonds of chitosan using a microwave-assisted process in an



eco-friendly environment. Afterwards, the synthesis of a new family of acrylated-COS derivatives was investigated by employing click-based approaches as a means to prepare a number of efficient dual-curing hydrogel inks. In these dual-curing inks, step-growth Michael addition polymerisation was combined with chain-wise acrylate homo-photopolymerisation. The initial Michael addition permitted the green synthesis of acrylated-COS derivatives under ambient and solvent-free conditions. Later, as a second curing stage, the unreacted acrylate groups participated in UV-induced photopolymerisation, becoming part of the final polymer network, thereby increasing the crosslinking density and shape-fidelity of the 3D-printed scaffolds.

Simultaneously, a new set of HA-based inks were developed. These inks, which were also prepared using the same carrier ink, had HA as the osteoconductive and mechanical reinforcement agent in their structure. The printing hydrogel inks in both groups were formulated to match the rheological properties requirements of the extrusion-based 3D-printing machine. The chemical compositions were optimised to permit rapid crosslinking of the hydrogel components and provide high shape fidelity of the printed scaffolds. The physiochemical properties of scaffolds including swelling behaviour, degradation rate, and compression strength were measured. It was shown that the material properties of these scaffolds were dependent on the weight fractions of COS and HA. The optimised COS-based (H0C2) and HA-based (H2C0 and H5C0) scaffolds were selected for further investigation into their potential to provide a three-dimensional environment suitable for the proliferation and differentiation of human bone marrow-derived mesenchymal stem cells (hBMSCs) towards osteoblast-like cells. 3D-printed scaffolds promoted osteogenic differentiation of hBMSCs where scaffolds containing 2 wt% COS (H0C2) showed higher cell viability and alkaline phosphatase (ALP) activity while scaffolds containing 2 wt% and 5 wt% HA (H2C0 and H5C0) exhibited higher calcium deposition as measured by Alizarin Red S (ARS) staining. All 3D-printed scaffolds demonstrated *in vitro* bioactivity in simulated body fluid (SBF), suggesting the osseointegration of these scaffolds *in vivo*. Altogether, optimised 3D-printed COS-based and HA-based scaffolds have promising applications for bone tissue regeneration.

## Doctor of Clinical Dentistry (DCLinDent) abstracts

2021

### Mohamed Shafiq Abdul Aziz

Abdul Aziz, M. S. B. (2021). Changes in mineral density and nanomechanical properties of enamel white spot lesions by dentifrices with different active ingredients for remineralisation - an *in vitro* study

*Advisors: Ekambaram, Manikandran; Loch da Silva, Carolina; Meldrum, Alison*

*Discipline: Paediatric Dentistry*

*Keywords: Novamin, functionalised-tricalcium phosphate, fluoride, dentifrice, pH cycling, caries*

<http://hdl.handle.net/10523/12517>

**Objectives:** This study aims to evaluate the remineralisation potential of fluoridated dentifrices with added active ingredients compared to a standard fluoride dentifrice with no additional active ingredients.

**Methods:** Artificial demineralised enamel lesions were formed by placing premolars into demineralising solution. The teeth were randomly assigned to 4 groups and subjected to 10-days pH cycling: Group 1: Sensodyne repair and protect® containing Novamin®; Group 2: Clinpro Tooth Crème® containing functionalised tricalcium phosphate; Group 3: Colgate® Cavity Protection containing 1450ppm fluoride; Group 4: Distilled water. Mineral density (MD) was assessed using Micro-CT while elastic modulus (EM) and hardness (H) were assessed using nanomechanical testing.

**Results:** Mean MD percentage gain was highest in Groups 1 and 2, followed by Group 3 and lowest in Group 4. There was no significant difference in mean MD percentage gain between Groups 1 and 2. Also, no significant differences were evident in the EM and H between the outer layer of the treated lesions of Group 1, Group 2 and Group 3 which were significantly higher than Group 4. The EM and H of the inner layer of the treated lesions were highest in Groups 1 and 2, followed by Group 3 and lowest in Group 4.

**Conclusions:** All tested dentifrices effectively remineralised the demineralised enamel lesions. The added active ingredients penetrated and remineralised the deeper parts of the carious lesions. However, there was no significant difference in remineralisation at the lesion surface between the tested dentifrices.

**Clinical Significance:** The use of dentifrices with enhanced remineralisation potential would benefit population with high caries risk and those with

limited access to dental care. This could lead to a decrease in cavitated carious lesions and a reduction in the burden of treatment costs to patients and funding bodies.

## **Zeina Al Naasan**

Al Naasan, Z. (2021). Community based oral health promotion among adult Syrian former refugees resettled in Dunedin, New Zealand

*Advisors: Broadbent, Jonathan; Duncan, Warwick; Smith, Moira*

*Discipline: Periodontology*

*Keywords: oral health; equity; access; oral health promotion; former refugees*

<http://hdl.handle.net/10523/12511>

**Introduction:** Resettled refugees suffer from unmet dental treatment needs at a high rate and face many challenges in accessing dental healthcare services. Relevant knowledge and favourable self-care practices are key to preventing oral conditions and enhancing engagement with available services.

**Aims:** To develop and evaluate a culturally appropriate oral health promotion intervention to reduce smoking, support and improve oral self-care behaviours, and facilitate access to dental health care services for a population of former Syrian refugees. This thesis aimed to answer the following questions: (1) What are the main barriers and facilitators former Syrian refugees face when seeking dental care in New Zealand? (2) Does this intervention improve oral health-related knowledge and behaviours of former Syrian refugees?

**Materials and methods:** This research took a mixed methods approach, including focus group sessions, one-on-one interviewing, questionnaires, and clinical data collection. Consenting former Syrian refugees (n=63, >18 years of age) who arrived in Dunedin, New Zealand, from 2016 to 2019 were invited to complete a dual English/Arabic language electronic questionnaire using the Qualtrics survey platform. This questionnaire collected data on participants' personal characteristics and oral healthcare habits. Those who completed the questionnaire were then invited to participate in a health promotion intervention in either an online group setting (n=39) or a 1-on-1 clinical dental setting (n=21); in total, 60 people participated, with the remainder not participating any further. , First, to identify challenges faced by Syrian former refugees in seeking oral health care, focus groups were conducted based on existing family/social networks and the interviews were conducted online via Zoom™. Secondly, to ensure cultural appropriateness, participants were invited to co-design a set of dual language (Arabic/English)

oral health education resources at the time of focus group meetings. Finally, to test the intervention, those who participated in a 1-on-1 clinical dental setting were dentally examined for caries, missing teeth, periodontal health, and oral hygiene; the findings of these examinations were discussed with each participant in their native Arabic language, and they were motivationally interviewed, encouraged to make a change to their oral self-care relevant to their individual risk factors. The co-designed resources were then sent to all participants monthly for five months, with a new theme for each month (oral home care, how to access dental care in New Zealand, how to quit smoking, sugars and dental health, and a summary in the final month). Finally, after six months, to evaluate the intervention, all participants were invited to complete a follow-up questionnaire (Appendix 11) and those who were in the clinical arm were dentally re-examined. All interviews were recorded, transcribed verbatim then translated to English. Thematic analysis involved familiarisation; coding of data; identifying themes, and collating data into themes; and reporting on the results. Quantitative findings were analysed statistically using the software Stata SE 15.1.

**Results:** Multiple factors hindered or facilitated the participants' ability to address their oral health needs, including finances, communication and language, providers' (poor) cultural competency and inherent process issues (structural); and participants' expectations of the oral health care system and differences to that in Syria, their oral health care attitudes and beliefs, and specific issues associated with resettlement (sociocultural). In the co-design of the health education resources, participants engaged well and provided considerable feedback. The resources were judged by participants as useful, easy to read, worthwhile and that even information which they already knew was useful and motivational. Participants' oral health self-care behaviours significantly improved following receiving these educational resources over a 5-month period. Over half of participants reported improvements to their toothbrushing behaviours, while among those who consumed sugary drinks at least weekly, over 90% reported having taken steps to reduce their sugar intake. None of the smoking participants quit smoking but 52.4% reported cutting back on their smoking. Among those who participated in the clinical arm of the study, oral hygiene was markedly improved (with a reduction in plaque scores of greater than 50%).

**Conclusion:** Former refugees experience barriers to accessing dental care. Their unique needs should be considered by policymakers and dental clinicians. The participatory intervention designed in this research was found to be effective in helping former refugees adopt better oral health behaviours. Future research should investigate whether this intervention should be implemented more widely among former refugees.

## Abed Badarneh

Badarneh, A. S. M. (2021). The effect of aging on the wear performance of monolithic zirconia

Advisors: Choi, Joanne Jung Eun; Lyons, Karl; Waddell, John Neil; Li, Kai Chun

Discipline: Prosthodontics

Keywords: monolithic; translucent; zirconia; aging; LTD; low temperature degradation; polish; glaze; wear

<http://hdl.handle.net/10523/12518>

The increase in patients' awareness and demands for metal-free, highly aesthetic restorations, even in the posterior area of the mouth, has contributed to the introduction of high-strength ceramics into dentistry. Yttrium-stabilised tetragonal zirconia polycrystals (Y-TZP) is by far the strongest of these compositions, however, it is opaque white in colour, which compromise its aesthetics properties, therefore, it was covered by a layer of more translucent veneering ceramic to improve the overall aesthetics of the restoration. However, chipping of the veneering layer is a frequent problem associated with these restorations, therefore, several zirconia compositions with enhanced translucency were introduced to allow the production of the full contour of the restoration from zirconia alone.

The elimination of the veneering layer brings zirconia into direct contact with the tooth material and the oral environment, increasing the risk of excessive tooth material wear as a result of the high surface hardness of zirconia. Additionally, the oral environment is an ideal place for phase transformation to happen which involves enlarging of the zirconia crystal that leads to microcracking, making zirconia more abrasive. Therefore, studying the effect of aging on wear behaviour of zirconia is of high importance.

This thesis begins with a literature review composed of two parts in which the peer reviewed literature of the various components of study was critically analysed and comprehensively presented. The first part focused on development of all-ceramic systems for the monolithic use, especially zirconia ceramics. The findings indicate that the literature lacks the answer to whether the different zirconia products of the same generation and the different generations share the same material properties. In fact, the dental research community is even unaware of this issue. Additionally, several monolithic zirconia compositions cannot be classified under the second or third generations of zirconia and yet they are being studied and referred to using broad terms like monolithic or translucent zirconia.

The second part of the literature review examined the *in vivo* and *in vitro* studies on wear performance

of monolithic zirconia against human enamel antagonists, to present and analyse the factors that control and modify the wear behaviour of monolithic zirconia in this tribological system. The findings indicated that zirconia is minimally abrasive to human enamel and less abrasive than the other dental ceramics, provided that its surface was polished, however, standard polishing protocols and surface roughness value that should be achieved to reduce abrasiveness of zirconia are yet to be determined. Furthermore, the studies on the effect of aging on wear of monolithic zirconia are lacking which motivated the conducting of the *in vitro* experiment presented in the next chapter. Additionally, the use of the number of wear simulation cycles as the base for comparing the results between the different studies is misleading and the total sliding distance should be used instead. The findings also agreed with part one of the literature review regarding the lack of distinction between the different zirconia products.

An *in vitro* study was conducted to study the effect of aging on the wear performance of monolithic zirconia. It was found that aging increased abrasiveness of monolithic zirconia regardless of the type of surface finish and that the effect of aging is "latent" and only revealed under mechanical loading during wear simulation which increased surface roughness and wear by adversely affecting zirconia's mechanical properties, making it less capable to maintain its initial surface smoothness. Also, the glaze layer may protect zirconia from low temperature degradation (LTD), however, it was susceptible to aging which further increased its abrasiveness.

## Ceridwen Benn

Benn, C. (2021). Promoting oral health in pregnancy. Exploring the needs of lead maternity care midwives

Advisors: Ting, Graeme; Bradford, Billie; Samaranayaka, Ari

Discipline: Special Needs Dentistry

Keywords: New Zealand; oral health; dentistry; midwifery; health promotion; maternal oral health; midwifery education; pregnancy

<http://hdl.handle.net/10523/12503>

Aims: To identify the educational needs of practising lead maternity care (LMC) midwives to facilitate their provision of evidence-based oral health advice and promotion to their clients during pregnancy. To identify the enablers and barriers LMC midwives face in providing evidence-based oral health advice and promotion to their clients during pregnancy. Additionally, to inform future development of resources to support the provision of evidence-based oral health advice and promotion by LMC midwives

to New Zealand women.

**Methods:** LMC midwives in New Zealand were invited to participate in a mixed- methods study comprising a web-based survey and semi-structured interviews.

**Results:** One hundred and eleven LMC midwives returned completed surveys, six participated in a semi-structured interview. There was no evidence to suggest the demographic characteristics of our survey sample were significantly different to the New Zealand midwifery workforce. More than three quarters (76.6%, 95% CI 67.6-84.1) provided oral health advice and promotion to clients, despite four fifths (81.1%, 95% CI 72.6-87.4) having no exposure to education regarding oral health in pregnancy. Nearly all (99%, 95% CI 93.8-99.9) LMC midwives believe oral health care is safe during pregnancy, and almost two thirds (65.8%, 95% CI 56.4- 74.1) believe maintaining good oral health is 'very important' to pregnancy wellbeing. Eighty percent identified two or more barriers to the provision of oral health advice and promotion. Crucial barriers identified by interviewees include burdening of midwives and women with respect to antenatal information volume, and accessing oral health care in the context of systemic barriers to oral health services in New Zealand. Crucial facilitators include enhancing internal motivation; holistic care; partnership; and driving change from within the midwifery workforce. Four out of five LMC midwives surveyed (81.1%, 95%CI 72.6-87.4) would like more education regarding oral health in pregnancy, with over half (58.6%, 95% CI 49.1-67.4) believing this should be included in undergraduate midwifery training. The belief that good oral health is 'very important' to pregnancy wellbeing was associated with a significantly increased likelihood of providing oral health promotion, OR 3.68 (95% CI 1.47- 9.16). Midwives with 11 or more years of practising experience were significantly more likely to provide oral health advice and promotion to their clients, OR 6.16 (95% CI 2.31-16.44) than those with less experience.

**Conclusions:** LMC midwives recognised the importance of oral health to pregnancy wellbeing, were receptive to oral health education, and promoting oral health as part of maternity care. LMC midwives require support through evidence-based midwifery-led education; development of culturally appropriate, fit-for- purpose resources; and interprofessional collaboration to address the systemic barriers to oral health services access for New Zealand women during pregnancy.

## Gabrielle Hunt

Hunt, G. R. (2021). Students' perceptions of undergraduate endodontic education and the impact of the COVID-19 pandemic in New Zealand

*Advisors: Friedlander, Lara; Chandler, Nicholas; Daniel Motidyang, Ben*

*Discipline: Endodontics*

*Keywords: Endodontics; Dental; Dental Education; COVID-19; New Zealand; Undergraduate Education; Perceptions of Undergraduate Education*

<http://hdl.handle.net/10523/12523>

Knowledge, understanding and developing clinical skill in endodontics is an essential competency for graduation in the Bachelor of Dental Surgery (BDS) degree, and for registration as a general dental practitioner (GDP). Historically, students have found learning and performing endodontic treatment a difficult and anxiety-inducing endeavour. These challenges can hinder their confidence which may negatively affect the quality of endodontic treatment performed after graduation.

The overarching aims of the research reported in this thesis are to investigate final year dental students' perceptions and experiences of the endodontic programme in New Zealand (NZ), and the extent to which such experiences were influenced by disruptions of the COVID-19 pandemic. An embedded mixed-methods research design was employed to capture students' perspectives and experience of learning endodontics over a two year period (2019 and 2020). An electronic survey with closed-ended questions (measured on a Likert scale) and open-ended questions was developed and sent to final year dental students (n=137) who were three months from graduation. The survey comprised of three sections. The first explored the students feelings of confidence, anxiety and preparedness to perform endodontics; the second explored the students' perceptions and clinical experience; and the third evaluated the outcome of teaching and learning by assessing the students application of endodontic theory to practice using clinical scenarios. In 2020, an additional section included questions related to the perceived impact of the COVID-19 pandemic and disruptions to clinical practice and learning. Data was analysed quantitatively using SPSS software and qualitatively using thematic inductive theory.

Results showed NZ graduating dental students in their final three months of study perceived endodontics as a valuable and interesting part of their professional programme. Maximising clinical experience and patient contact at dental school, the importance of appropriate case selection and strong clinical supervision, particularly from those with specialist skill, were critical to improving confidence



in endodontics before entering the workforce. Students perceived their knowledge, skills and confidence to be negatively affected because of the COVID-19 pandemic. The results of the clinical decision-making task did not support this, suggesting there may be a gap between students actual knowledge and skills in endodontics and how they perceive their abilities.

The findings from this research can be used to investigate ways in which dental students can be supported while learning and performing endodontics, as well as the long-term effects of the COVID-19 pandemic.

### Emma Jefferies

Jefferies, E. A. (2021). Oral health and oral-health-related quality of life of a group of young adults using mental health services in Christchurch

*Advisors: Ting, Graeme; Thomson, Murray; Gray, Juliet*

*Discipline: Special Needs Dentistry*

*Keywords: Oral health; Mental health; Severe mental illness; oral-health-related quality of life; New Zealand*

<http://hdl.handle.net/10523/12515>

**Background:** Young people experiencing a first episode of psychosis represent a vulnerable group of individuals with severe mental illness (SMI) who face poorer physical health than the general population across a range of conditions, with oral health no exception to that. The reason for this disparity is likely multifactorial, being a combination of medical, social, economic and lifestyle factors. Oral health is an important part of general health and well-being. Poor oral health can negatively impact an individual's self-esteem, social interactions and their ability to eat, talk, smile, and laugh. Despite an improvement in overall population oral health, people with SMI appear to remain disadvantaged, experiencing poorer oral health and oral-health-related quality of life (OHRQoL) than the wider population.

This study investigated the oral health and OHRQoL of a group of young people with SMI in Christchurch, New Zealand. These individuals were being supported by Totara House, an early intervention, specialist, multidisciplinary service for young people experiencing their first episode of psychosis.

There is limited research in this field worldwide, with very few studies to have investigated oral health and OHRQoL in people with SMI. Only one such study exists in New Zealand (Broughton et al. 2020). That study observed longitudinal changes in the OHRQoL of these individuals and demonstrated that providing a comprehensive course of dental treatment greatly

improved their OHRQoL. The current study adopted a similar methodological approach to that study by Broughton et al. (2020), with the aim to build on those findings.

**Objectives:** The objectives of this study were to:

- (1) Describe the oral health status and dental treatment needs of mental health service users in Christchurch and compare this to a similar age group in the general population;
- (2) Examine and quantify the impact of providing a course of dental treatment and preventive care on the OHRQoL of this group of mental health service users; and
- (3) Add context to these quantitative findings through qualitative interviews that explored the views of staff involved in the provision of services at Totara House and the Christchurch Hospital Dental Service.

**Methods:** A mixed-methods approach to an interventional study was undertaken, using a pre-post- treatment design complemented by qualitative interviews. A total of 35 participants (aged 18-30 years) were recruited from Totara House. They completed baseline questionnaires investigating sociodemographic, dental and self-care characteristics, dry mouth experience, dental fear, personality traits and OHRQoL (the latter measured using the OHIP-14). Baseline oral health status was recorded clinically and summarised as DMFT/DMFS scores and periodontal disease extent and severity. A comprehensive course of dental treatment and preventive care was then completed, with questionnaires repeated two months following treatment completion. A total of 11 participants completed the study in its entirety. Semi-structured qualitative interviews were also conducted to explore the views of six staff members on barriers to care as well as the sustainability and satisfaction of the integration of oral health care into the existing care at Totara House.

**Results:** The mean baseline OHIP-14 score was 20.6 (SD=10.2), and the majority of participants (77.1%) reported one or more OHIP-14 impact "fairly often" or "very often". Psychological discomfort was the domain with the highest impact prevalence as well as the most severely- affected domain. A statistically significant improvement in OHRQoL was observed after dental treatment: the mean OHIP-14 score decreased from 19.9 (SD=9.9) before treatment to 14.7 (SD=10.0) after treatment; this represented a moderate improvement (ES=0.5) in OHRQoL after dental treatment. Likewise, OHIP-14 impact prevalence showed a statistically significant decrease, from 90.9% before treatment, to 36.4% after treatment.

The participants showed higher caries and periodontal disease experience than that of their age group in the wider population, with higher mean DT and DMFT and a higher prevalence of periodontal disease than 18-30-year-olds in the wider New Zealand population.

The key qualitative findings were that the integration of oral health services into the existing services at Totara House reduced barriers to oral health care and improved engagement with mental health services.

**Conclusion:** This study demonstrated that oral problems had a substantial impact on the well-being of these individuals at baseline, but that providing a comprehensive course of dental treatment significantly reduced the impact of oral problems on their day-to-day lives. The poor baseline oral health status seen in this group further highlights their unmet dental treatment need. Furthermore, not only does providing oral health care to these individuals improve their oral health and well-being, but it may also improve their mental health, through improved quality of life and better engagement in mental health services.

### Anthony Kao

Kao, A. Y.-C. (2021). Effect of mechanical decontamination procedures on moderately roughened titanium surfaces: quantity and size of the titanium particulate released by mechanical instrumentation

*Advisors:* Tawse-Smith, Andrew; Ma, Sunyoung; Atieh, Momen; Duncan, Warwick; Reid, Malcolm

*Discipline:* Periodontology

*Keywords:* Titanium; Implant; Peri-implantitis; Instrumentation; Decontamination; SEM; ICPMS

<http://hdl.handle.net/10523/12513>

Biological complications can compromise the longevity of a dental implant. Although bacteria biofilm is the only accepted sole aetiology, other potential risk indicators, such as the presence of titanium (Ti) particulate in the peri-implant tissues, are currently under investigation to determine their role in peri-implantitis.

**Objectives:** This thesis investigates the effect of commonly used mechanical decontamination procedures on a moderately roughened Ti surface. In addition to a comprehensive literature review on the Ti surface alteration induced by mechanical instrumentations, a systematic review, and an *in vitro* study were conducted to present the existing evidence and evaluate the size and quantity of Ti particulate that is released from Ti surfaces during common mechanical surface decontamination methods.

**Methods and Materials:** A PICO framework was used as a frame for the topic and appropriate keywords were searched in EMBASE, via the Ovid and PubMed databases, up to December 2020 to identify all types of studies that evaluated post-instrumentation changes in Ti surface element composition and the physical characteristics of released Ti particles, including the quantity and the size of particles. All types of Ti surface, mechanical decontamination methods, and measuring methods were included.

For the *in vitro* study, 140 moderately roughened Ti discs were divided into seven groups ( $n = 20$  in each group). Six groups received mechanical decontamination procedures: ultrasonic scaling with metal tip or polyetheretherketone (PEEK) tip under both low and medium power settings, air-polishing with erythritol powder, Ti brush, and a control group underwent air-water spray using dental triplex. The rinsing solutions were collected for analysis. The mass of Ti was analysed by inductively coupled plasma mass spectrometry (ICP-MS) and Ti particle size was measured by the scanning electron microscope (SEM) with the aid of energy dispersive X-ray spectrometry (EDS) for particle differentiation.

**Results:** Three studies evaluated the quantity of Ti particulate released during ultrasonic scaling. A significantly higher number of Ti particles and higher Ti weight was found in the rinsing solution of ultrasonic scaling with metal tips in comparison to PEEK plastic tips. Moderately roughened surfaces were found to shed more Ti particles than machined smooth Ti surfaces during instrumentation. Only one study analysed the size of metal particle found in the rinsing solution of ultrasonic scaling with metal tips. No significant difference in particle size was found between machined, and-blasted and acid-etched (SLA), and a sand-blasted Ti surface ( $7.57 \pm 1.43 \mu\text{m}$ ,  $7.57 \pm 2.75 \mu\text{m}$ , and  $8.37 \pm 2.94 \mu\text{m}$ , respectively). Furthermore, remnant particles derived from non-metal instruments, including air-polishing powder, have been consistently identified in element composition analyses. However, on a contaminated Ti surface, the elemental profile is mostly altered by the bacterial biofilm rather than remnant deposition of the instruments.

This current *in vitro* study demonstrated that ultrasonic scaling with a metal tip generated  $34.00 \pm 12.54 \mu\text{g}$  and  $34.40 \pm 6.08 \mu\text{g}$  of Ti under low and medium power settings, respectively. This was significantly higher than other instrumentation groups. The mean Ti particle size of the ultrasonic scaling groups ranged from  $0.89 \pm 0.27 \mu\text{m}$  to  $1.25 \pm 0.24 \mu\text{m}$ . No statistical significance was found in the particle size among ultrasonic scaling groups and the Ti brush group ( $1.05 \pm 0.11 \mu\text{m}$ ), except for ultrasonic scaling using a PEEK tip where a significantly smaller particle diameter was found in a low power setting ( $0.89 \pm 0.27 \mu\text{m}$ ) compared to a medium setting ( $1.25 \pm 0.24 \mu\text{m}$ ).

**Conclusion:** Mechanical decontamination of moderately roughened Ti discs produced Ti particulate and surface modification to various extents. Ultrasonic scaling using a metal tip generated the highest amount of Ti with smaller size Ti particles when compared to all other commonly used mechanical surface instruments. The EDS analysis confirmed Ti in PEEK ultrasonic scaling tips. On this basis, it can be suggested that the deterioration of the PEEK ultrasonic scaling tip and the Ti brush, as observed under the SEM, is an additional source of Ti release during Ti surface decontamination.

The size of metal particles identified was found to be within the threshold for phagocytosis. Existing evidence is weak, however, and limited to ultrasonic scaling only. More quality studies with valid outcome measurements for inter-study comparison are needed to answer the PICO question comprehensively. Furthermore, the clinical impact of altered Ti surface element composition requires further investigation.

### Reginald Kumar

Kumar, R. A. J. (2021). What's in a smile? An investigation of the effect of ethnic background on smiling features

*Advisors: Farella, Mauro; Firth, Fiona; Halberstadt, Jamin*

*Discipline: Orthodontology*

*Keywords: Bula Smile; Smiling; Fiji Smiles; Ethnicity and Smiling*

<http://hdl.handle.net/10523/12524>

**Objectives:** The Fijian smile, also called the “Bula Smile,” is often described as the world’s friendliest. The description of Bula Smile, however, remains anecdotal. This project aimed to describe and compare the features of Fijians’ smiles with those of New Zealand Europeans.

**Methods:** An observational study was conducted on two ethnic groups, Fijians (FJ; N=23) and New Zealand Europeans (NZ; N=23), matched for age and gender. All participants were asked to watch a series of amusing videos, and their reactions were recorded using a 4K web camera. The videos were analysed using bespoke pattern recognition software to assess the frequency, duration, intensity, and genuineness of smiling episodes. The software had been previously validated against the Facial Action Coding Systems (FACS) Action Units 6 (AU6 - cheek raiser), 12 (AU12 - lip corner puller), and 25 (AU25 - lips apart) (see Chapter 2 for details). The participants also completed a 60-item personality (IPIP NEO) and the Smile Esthetics-Related Quality of Life measures (SERQoL). Malocclusions were assessed using the Dental Aesthetic Index (DAI). Data were analysed by generalised linear models.

**Results:** Fijians smiled longer than New Zealand Europeans (+19.9%;  $p=0.027$ ), but the number of smiles per minute did not differ between groups ( $p=0.083$ ). Mean intensity of AU6 (+1.0; 95%CI=0.6-1.5;  $p<0.001$ ), AU12 (+0.5; 95%CI=0.1-0.9;  $p=0.008$ ) and AU25 (+22.3%; 95%CI=7.3-37.3%;  $p=0.005$ ) were all significantly higher in FJ group than in NZ group. Compared to the NZ group, the FJ group scored lower on openness (-4.0;  $P=0.026$ ) and higher on SERQoL (+3.0;  $P=0.003$ ), the latter indicating less confidence with their smile. The DAI index did not differ between the two ethnic groups.

**Conclusion:** Smiling features of Fijians and New Zealanders showed objective differences, as represented by the mean activity of FACS AUs, which could not be explained by personality traits, self-confidence with their smile, and malocclusion severity. The most distinctive trait of the Fijians smile was the higher activation of the Duchenne’s marker (AU6), which indicates “smiling with the eyes”, and is regarded as a sign of smile genuineness.

### Mohd Mohamed Ashri

Mohamed Ashri, M. H. B. (2021). Perceived confidence in performing peripheral venipuncture among dental practitioners in New Zealand and Malaysia

*Advisors: Ting, Graeme; Hamzah, Siti Zaleha; Tong, Darryl*

*Discipline: Special Needs Dentistry*

*Keywords: Malaysia; New Zealand; Peripheral; Venipuncture; Confidence*

<http://hdl.handle.net/10523/12526>

**Aims:** This research described the perceived confidence in performing peripheral venipuncture among dental practitioners in New Zealand and Malaysia and determined the preferred mode of training in peripheral venipuncture from the dental practitioners' perspective.

**Introduction:** This exploratory cross-sectional correlational, quantitative study involved the participants completing online questionnaires. The study populations were registered dental practitioners holding the current Annual Practising Certificates during the data collection in 2020 and were either registered with the Dental Council of New Zealand or the Malaysian Dental Council. The data analysis was performed using Microsoft Excel and Statistical Package for the Social Sciences version 25.

**Results:** The response rates received from eligible dental practitioners in New Zealand and Malaysian represented 4.7% and 4.3% of registered, actively practising dental practitioners for each country, respectively, in 2020. In New Zealand, 44% of

dental practitioners reported exposure to peripheral venipuncture as undergraduates, while in Malaysia, it was 45%.

47% of New Zealand dental practitioners reported confidence in performing peripheral venipuncture during routine dental practice and 29% during medical emergencies. In Malaysia, 21% felt confident performing peripheral venipuncture during routine dental practice, while 9% felt confident performing peripheral venipuncture during medical emergencies. In New Zealand, 65% perceived peripheral venipuncture training as essential, while in Malaysia, 81%. Both New Zealand and Malaysian dental practitioners would prefer peripheral venipuncture training through clinical activities, workshops, simulated practice with a mannequin arm, and inclusion in undergraduate and postgraduate curriculum programmes.

**Conclusion:** Peripheral venipuncture is a very commonly performed and essential medical procedure. A competent level of skill in performing peripheral venipuncture is a valuable asset for dental practitioners. The results of this study could be used to inform training programmes in peripheral venipuncture for dental practitioners. It is hoped that these educational resources could be deployed to maintain competence, improve skills and boost confidence in this area of patient care.

### Suneil Nath

Nath, S. J. C. (2021). *Biomimetic remineralisation: A comparative evaluation of the enamel remineralisation potential of a short, medium, and long chain self-assembling peptide*

*Advisors: Ekambaram, Manikandan; Li, Kai Chun*

*Discipline: Paediatric Dentistry*

*Keywords: Biomimetic remineralisation, Curodont Repair®, P26, LRAP, early enamel caries lesion, pH cycling*

<http://hdl.handle.net/10523/12522>

Dental caries is a dynamic noncommunicable disease which is multifactorial and dependent on the biological oral environment, human behaviour, and the social determinants of health. The World Health Organisation (WHO) identifies dental caries as the most prevalent and consequential oral disease affecting all age groups on a global scale, leading to large economic costs and lost productivity.

The clinical management of dental caries can be challenging for paediatric dental patients and dental practitioners. Dental caries remains the most common chronic disease in children resulting in six hundred million children with untreated dental

caries worldwide in the year 2010 alone. According to the 2009 New Zealand Oral Health Survey, Māori and Pacific children and adolescents residing in higher socio-economic deprivation areas had the worse oral health outcomes.

The dental biofilm is a bacterial pellicle harbouring cariogenic mutans streptococci and lactobacilli which contribute to the microbial fermentation of residual foods leading to acid production and consequently leading to mineral loss from the tooth structure. Demineralisation is the loss of minerals from the tooth structure while remineralisation is the net mineral gain in demineralised tissue. When the caries activity is high and the oral environment favours the demineralisation cascade, an early enamel caries lesion initiates which is usually non-cavitated and white in appearance (white spot lesion).

Early enamel caries lesions (EECLs) describe the stage of the caries severity and not caries lesion activity. Minimal intervention dentistry (MID) is the minimal operative procedure that is rendered for the holistic management of the EECLs with the aim to preserve dental tissue. There is ongoing advocacy for early treatment of dental caries before cavity formation. Home care and professionally applied fluoride gels and varnishes have been the mainstay topical agents in promoting EECL remineralisation while newer strategies are being developed. Self-assembling peptides (SAPs) have shown potential in remineralisation of EECLs.

SAPs act as biological molecules and based on the self-assembling property of amelogenin and leucine rich amelogenin peptide (LRAP). SAPs claim stabilisation of the mineral due to the presence of the peptides and greater depth of remineralisation in EECLs. However, there is little evidence from standardized *in vitro* and *in vivo* research to support such claims. The aim of this laboratory-based research was to compare the remineralisation efficacy of a short (Curodont Repair® (P11-4)), medium (P26), and long (LRAP) chain SAP with the standard 5% NaF varnish (Duraphat®) on EECLs.

Research ethics approval was obtained for collection of 25 sound premolar teeth. Enamel specimens were prepared according to the research protocols. Demineralising solution was used to create artificial EECLs in polished human dental enamel specimens, which were randomly allocated to the following treatment groups (n=10): Group 1: P11-4; Group 2: P26 solution; Group 3: LRAP solution; Group 4: 5% NaF varnish and Group 5: Deionised water (DIW). Following the treatment as per prescribed protocols, each specimen was subjected to eight days of pH cycling. Specimens from each test group were subjected to Micro-CT scans and nanomechanical testing to assess the mineral density (MD), hardness (H) and the elastic modulus (EM) properties of the sound, demineralised and treated enamel.



The mean MD percentage gain was highest in the P26 and P11-4 groups, followed by the LRAP, 5% NaF varnish and DIW groups. There was statistically significant difference between the four treatment and the negative control groups. In the outer layer of the artificial EECLs, the EM and H were highest amongst the P26, P11-4, followed by the LRAP and Duraphat. In the inner layer, the EM and H were highest amongst P11-4 and P26 groups, indicative of enhanced penetration and remineralisation of the deeper parts of the EECLs.

Self-assembling peptides P26 and P11-4 are more effective than 5% NaF varnish in remineralising the surface and deeper parts of the EECLs. The synergistic effect of SAPs and other homecare and professionally applied topical agents should be investigated. Although further research is warranted, it is expected that the integration of SAPs into the clinical management of EECLs will lead to favourable clinical outcomes. This supports the new paradigm of minimally invasive procedures for atraumatic experiences and improved quality of life for paediatric dental patients and their families.

### Marguerite Paterson

Paterson, M. A. (2021). Modulation of osteoblasts and periodontal ligament cells by IL-17 and IL-6

*Advisors: Firth, Fiona; Milne, Trudy; Farella, Mauro*

*Discipline: Orthodontics*

*Keywords: New Zealand; Orthodontic tooth movement; In vitro*

<http://hdl.handle.net/10523/12520>

**Background:** Orthodontic tooth movement (OTM) requires mechanical stimuli to remodel the periodontal ligament and alveolar bone. During OTM, an inflammatory-like response is mediated by various signalling molecules. Two important cytokines involved in this response are interleukin-17 (IL-17) and interleukin-6 (IL-6).

**Aim:** To determine whether the addition of IL-17 and/or IL-6 affects the expression of genes associated with osteogenesis.

**Methods:** Cultures of human calvarial osteoblasts (hCO) (N=1) and human periodontal ligament cells (hPDLs) (N=4) were grown alone or together (co-culture) in the presence of 0–75 ng/mL IL-17 and/or IL-6 for 72 hrs. The effect of osteogenic triple supplement (TS) was also investigated. Cell viability was monitored with PrestoBlue™. Levels of osteogenic gene expression were determined by qPCR assays. ANOVA and Tukey's post-hoc tests were employed for statistical analysis.

**Results:** The addition of IL-17 and/or IL-6 had no significant effect on cell viability over 72 hrs. The addition of TS to hCO baseline cultures resulted in significantly increased OPG and ALP mRNA expression compared to negative control (3.8-fold;  $p=0.020$  and 25-fold;  $p=0.034$ , respectively). RANK expression increased in response to IL-17 in a dose dependent manner ( $p=0.003$ ). hPDLs gene expression were unaffected by the addition of IL-6, but showed increased ALP mRNA expression in response to IL-17 (4-fold;  $p=0.042$ ). In co-culture with TS, the addition of IL-17 and IL-6 increased hCO RANK expression (5.8-fold;  $p=0.004$ ). hCO ALP expression decreased in the presence of IL-17, IL-6, and IL-17 with IL-6 (148-fold;  $p=0.001$ , 2-fold;  $p=0.002$  and 413-fold;  $p=0.001$  respectively). When compared to monocultures, hPDL RANK mRNA expression was greater for untreated cells (390-fold), and in the presence of IL-17 (33-fold) and IL-6 (9888-fold) in co-culture at 48 hrs.

**Conclusion:** The addition of IL-6 and IL-17 decreases OPG and ALP expression and increases RANK in hCOs. This effect is amplified in the presence of hPDLs, and may play a role in stimulation of bone remodelling associated with OTM.

### Manori Rupasinghe

Rupasinghe, M. L. (2021). Oncology and dentistry: a regional hospital perspective

*Advisors: Ting, Graeme; Thomson, Murray*

*Discipline: Special Needs Dentistry*

*Keywords: oncology; cancer; oral health; New Zealand; DHB; Hospital dentistry; oral complications*

<http://hdl.handle.net/10523/12519>

**Introduction:** Oral health services provided by New Zealand District Health Boards vary in the types of treatment provided to patients across the country, and also in the case-mix of patients they see. The high needs and vulnerable population, which includes oncology patients, are recognised as a core patient group for care by District Health Board dental departments. Oncology patients undergo various modes of treatment for their cancer, including surgical interventions, radiation therapy, intravenous bisphosphonate infusions and chemotherapy. These treatments have general systemic and oral health effects. Acute or chronic oral conditions can delay or complicate oncology treatments, patients are referred for a dental assessment to reduce the likelihood of complications arising from poor oral health. Many studies have explored head and neck cancer and its relationship to oral health. Less research has described the relationship between other cancer types and oral health. In Northland, there has been an observed influx of patients with a variety of cancer

types being seen through the District Health Board Oral Health Service. It is important to investigate why these patients are being referred, what cancer treatment they receive, and what their dental experience has been.

**Aims:** To explore oncology patient trends at Northland District Health Board Oral Health Services from 2016 to 2020; and to describe oncology patient dental experience, behaviour and Oral Health Related Quality of Life.

**Methods:** There were two components to this research. A case-series analysis of oncology patients that had clinic appointments at Northland District Health Board Oral Health Services was carried out by searching the dental software 'Titanium' and manual cross-checking with patient event data on Northland District Health Board records. A questionnaire was used to retrospectively explore the Oral Health Impact Profile and dry mouth experiences of oncology patients seen by Northland District Health Oral Health Services. The validated measures of the short-form Oral Health Impact Profile (OHIP-14) and the Shortened Xerostomia Inventory (SXI) were used. Answers to various oral health related questions were obtained and demographic characteristics were summarised.

The IBM SPSS version 25 and the Stata Corp (2021) Stata IC statistical software version 16 packages were used to analyse the data.

**Results:** Some 584 oncology patients were seen from 2016 to 2020, involving over 2000 separate patient events in this period. Multiple cancer type patients were being referred to Northland District Health Board Oral Health Services. Patients with head and neck cancer were being seen, but a high proportion of referrals were for patients with breast cancer. The most common reason for referral was intravenous bisphosphonate use. The participants reported good Oral Health Related Quality of Life. The majority of the group maintained good oral health and were happy with the information received from doctors and dentists involved in their care. The participants reported suffering from severe xerostomia.

**Conclusion:** A variety of oncology patient types are being referred to Northland District Health Board Oral Health Services. These patients are being referred for a range of reasons and at different stages of their cancer treatment. The survey sample reported good Oral Health Related Quality of Life; this may be due to the ongoing and frequent care they receive, but they do suffer from xerostomia.

## Michael Skilbeck

Skilbeck, M. G. (2021). Surface modification of orthodontic elastomers to overcome biofilm formation

*Advisors:* Mei, Li; Farella, Mauro; Cannon, Richard

*Discipline:* Orthodontology

*Keywords:* New Zealand; orthodontics; elastomers; biofilm; superhydrophobic

<http://hdl.handle.net/10523/12512>

**Introduction:** One of the major problems for patients undergoing treatment with fixed orthodontic appliances is the development of oral biofilm-related disease. One way to potentially reduce biofilm formation is to modify the appliance surface characteristics to make it less adherent to bacteria. The aim of this study was to create a superhydrophobic surface on orthodontic elastomeric chain material to reduce bacterial adhesion.

**Materials and Methods:** Orthodontic elastomeric material was modified with sandpaper of various grit sizes. Custom made jigs were used to stretch the elastomers to 150% and 200% of initial length. Surface characteristics were assessed quantitatively with confocal microscopy and qualitatively with scanning electron microscopy. Contact angles were measured using a goniometer. Bacterial adhesion was measured after incubating saliva coated elastomers with *Streptococcus gordonii* ATCC10558 for 30 minutes, by counting colony forming units on Columbia sheep blood agar plates.

**Results:** Abrasion with sandpaper of grit size 80-600 produced elastomers with surface roughness (Ra) of 2-12  $\mu\text{m}$ . The effect of extending these elastomers on roughness was variable. Contact angles were found to follow a quadratic trend with a maximum contact angle of 104° at an Ra of 7-9  $\mu\text{m}$ . Maximum contact angles, when viewed perpendicular to stretch, were found to decrease from 104° to 95° when the extension was increased from 100 to 200% and increased from 102° to 105° when viewed parallel to the stretch. Bacterial adhesion increased exponentially as roughness increased and this effect was more pronounced with elastomer extension.

**Conclusions:** It was not possible to obtain a superhydrophobic surface, with an advancing contact angle >150° and contact angle hysteresis  $\leq 4$ , using sandpaper abrasion. All surface modifications increased bacterial adhesion to the elastomer.

## Julia Smith

Smith, J. M. (2021). Predictability of lower incisor root tip with the invisalign appliance

*Advisors: Farella, Mauro; Weir, Tony; Kang, Austin*

*Discipline: Orthodontics*

*Keywords: Invisalign; Orthodontics; Clear aligners*

<http://hdl.handle.net/10523/12521>

**Introduction:** Root tip (orthodontic movement of the root in a mesio-distal direction) occurs when a high moment-to force ratio is applied to the crown of a tooth. In this situation the centre of rotation is located approximately at the incisal edge. Uprighting incisors in the coronal plane is particularly important with clear aligner therapy (CAT). The tip of a tooth determines the amount of space it occupies (mesio-distally) and subsequently the fit of the aligner.

**Objectives:** To investigate the ability of ClinCheck® to accurately predict lower incisor root tip by comparing simulated movements with actual clinical outcomes and to determine whether the presence of a vertically orientated rectangular composite attachment influences the efficacy of root tip.

**Methodology:** This retrospective study included 66 lower incisors from 42 non-extraction adult patients treated using the Invisalign® appliance. Twenty-one incisors had vertical attachments while 45 incisors did not have any attachments. A customised method for measuring tip and classifying orthodontic tooth movement (OTM) type was developed. Lower incisor root tip was measured at T0 (pre-treatment), T1 (predicted post-treatment) and T2 (achieved post-treatment) on digital models using metrology software (Geomagic Control X). The change in position from T0 to T1 (predicted) and T0 to T2 (achieved) was measured from the estimated centre of resistance (CRes) of each tooth. The estimated centre of rotation (CRot) was plotted relative to the CRes to describe the type of tooth movement predicted and achieved.

**Results:** A positive correlation was found between predicted root tip and achieved root tip ( $R^2 = 0.55$ ;  $p < 0.001$ ). For every degree of root tip planned 0.4 degrees of tip was achieved. The presence of an attachment resulted in 1.2 degrees greater root tip ( $F=3.7$ ;  $p=0.062$ ) and 0.5mm greater movement of the predicted apex of the tooth ( $F=4.3$ ;  $p=0.042$ ) compared with the no attachment group. The type of OTM achieved differed from the type predicted. Sixty-seven percent of incisors investigated were predicted to move by root movement, while only 46% achieved this type of movement.

**Conclusions:** The amount of root tip achieved was on average substantially less than the ClinCheck® displayed. Vertically orientated rectangular

attachments are recommended where substantial root movement is planned, and their presence slightly improves apex movement.

## David Yong

Yong, D. (2021). Development and analysis of a novel bovine hydroxyapatite calcium silicate cement for conservative pulp therapy

*Advisors: Cathro, Peter; Ratnayake, Jithendra; Choi, Joanne; Paul, Cooper; Dias, George*

*Discipline: Endodontics*

*Keywords: Calcium silicate cement; Endodontic; Vital pulp therapy; Conservative pulp therapy; Dental biomaterials*

<http://hdl.handle.net/10523/12506>

**Aim:** To develop an experimental endodontic cement using bovine bone-derived hydroxyapatite (BHA), Portland cement (PC), and a radiopacifier and to characterize its physicochemical and biological properties for use in endodontic treatment.

**Methods:** BHA was manufactured from waste bovine bone and milled to form a powder. Four BHA supplemented PCs (BHA 10%/20%/30%/40%), a 10% nanohydroxyapatite (NHA) supplemented PC and an unsupplemented PC (PC65) were manufactured. A radiopacifier, either zirconia (ZrO) or tantalum (TaO) and a plasticizing agent were also included. The raw materials and synthesized cements were chemically characterized and cements were tested to evaluate their radiopacity, compressive strength, setting time, solubility, pH, and biocompatibility (using Saos-2 osteosarcoma cells). The radiopacity and biocompatibility of these cements were also compared with ProRoot MTA (PR-MTA). Compressive strength, solubility and pH were evaluated over a 4-week curing period.

**Results:** The compressive strength of all cements increased with the extended curing times, with a significant increase in all groups from day 1 to day 28. The BHA10% group exhibited significantly higher compressive strength than: PC65, NHA & BHA30/40% at day 1; NHA, BHA30/40% at day 7; and PC65, NHA & BHA30/40% at day 28. The BHA10/20% groups exhibited significantly longer setting times than BHA 30/40% and PC65. NHA exhibited a longer setting time than any other material. No significant difference was observed between cements in terms of solubility and pH during 4-weeks of observation. ZrO was a more effective radiopacifier by weight than TaO. BHA did not alter radiopacity of cements. BHA 10/20% demonstrated significantly higher cell counts compared with BHA 30/40% and MTA at 72 h exposure.

Conclusions: The addition of 10% and 20% BHA to an experimental PC-based cement containing 35% ZrO improved the material's mechanical strength while enabling similar radiopacity and biocompatibility to PR-MTA. BHA is a cost effective additive which has the potential to improve the properties of calcium silicate endodontic cements.

2022

Sherry Lee

Lee, S. (2022). Patients' experiences with orthodontic treatment through traditional fixed appliances, clear aligners and direct-to-consumer clear aligners: a qualitative study

*Advisors: Firth, Fiona; Daniel, Ben; Farella, Mauro*

*Discipline: Orthodontics*

*Keywords: Orthodontic treatment; Patient experience; Clear aligners; Direct-to-Consumer; Braces*

<http://hdl.handle.net/10523/14173>

Background: Traditional fixed appliances (TFAs) with metal brackets and wires have long been the modality of choice for treating orthodontic patients. With modern society's enthrallment with an individuals' outward appearance, anecdotal evidence from clinical observations suggest a steady increase in the use of clear aligners (CAs) and direct-to-consumer (DTC) CAs. Although the clinical efficacy of DTC CAs remains unsupported by research, there is a growing interest among the public to seek DTC clear aligner (CA) treatment and thus, there is a need to turn to patients to understand their experience with orthodontic treatment.

Methods: An exploratory case study design was employed to gain an in-depth understanding of the underlying motivations, reasons and perspectives of patients who have undergone orthodontic treatment. Thirty New Zealand based adults over the age of eighteen were recruited via advertisements on social media sites using a purposeful sampling technique. A single investigator conducted one-on-one semi-structured interviews with key questions exploring themes relating to motivation of patients undertaking orthodontic treatment, their choice of a specific treatment modality, the information they received prior to treatment, the challenges they faced, as well as their experience with orthodontic treatment. The interview transcripts were transcribed verbatim and analysed with the NVivo software (Version 1.5.1, QSR International Pty Ltd., Burlington, MA, USA), using inductive thematic analysis. The standard criteria of reporting qualitative studies:

Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist was followed, as well as the Trustworthiness, Auditability, Credibility and Transferability (TACT) framework to ensure rigour.

Results: The five principal themes identified are as follows: (1) motivation for orthodontic treatment (2) the decision for selecting a specific treatment modality (3) patient information and education (4) patient experience with treatment and (5) the challenges faced during treatment. The commonly shared reasons individuals sought orthodontic treatment included self-consciousness, aesthetics, a need for treatment, familial influence, crooked teeth, relief of previous financial constraints, cleansability and relapse. The rationale behind participants seeking treatment with a specific treatment modality included recommendation by their treatment provider, trust in the treatment appliance, cost, age, working environment, aesthetics, marketing and the idea of DTC CAs being a disrupter to the orthodontic profession. There was a range in the quality and quantity of information provided to each participant prior to commencing orthodontic treatment. The majority of patients' experiences were positive, with participants expressing satisfaction with their treatment outcome. An increased awareness and self-reported improvement in oral health occurred as a result of orthodontic treatment. The coronavirus disease of 2019 (COVID-19) and pain were common treatment challenges reported by all participants, with other reported problems including broken brackets, appointment availability, the use of DentalMonitoring® (Paris, France), poor aligner fit and quality, poor post-treatment occlusion and the lack of communication from certain DTC CA companies.

Conclusion: Self-consciousness, aesthetics and previous financial constraints were the main motivating factors for participants seeking treatment and cost was the most influential factor when selecting a specific treatment modality. The information provided to each participant prior to commencing treatment was not equal, however patient experience with orthodontic treatment in New Zealand was generally positive. The challenges faced by participants throughout their course of treatment included broken brackets, appointment availabilities, pain, poor aligner fit and quality, a lack of communication from certain DTC CA companies as well as COVID-19.



## Beatrice Ng

Ng, B. M. M. (2022). Acceptability and feasibility of teledentistry use in aged residential care facilities in the Otago region of New Zealand

*Advisors: Smith, Moira Beatrice; Samaranayaka, Ariyapala*

*Discipline: Special Needs Dentistry*

*Keywords: Oral health; Oral health services; Teledentistry; Older people; Aged residential care; Gerodontology*

<http://hdl.handle.net/10523/14154>

Paralleling the global ageing phenomenon is a greater proportion of older people moving into aged residential care (ARC). ARC residents have poor oral health and oral health-related quality of life. With few skilled caregivers relative to the number of residents in ARCs, most of whom have multimorbidity, polypharmacy, and high general care requirements, residents' oral health is often neglected until an acute problem arises. Moreover, ethnic, socioeconomic, and level of care dependency-related disparities exist among older people. A key barrier to residents' good oral health and well-being is their difficulty in accessing oral health care services. Means of overcoming access barriers to essential oral health care are urgently needed. Teledentistry offers a possible solution, yet there are few international studies on teledentistry in ARCs, and none in New Zealand (NZ). Understanding more about its feasibility and acceptability among ARC residents and staff would inform its implementation.

This study aimed to determine ARC residents' and staff perceptions of the benefits of and comfort with teledentistry use in ARCs in the Otago region of NZ, and to identify end-user-level factors associated with its use in ARCs in NZ.

This study uses a cross-sectional design and a quantitative approach. Rest-home level residents and care staff in ARCs in the Otago region were surveyed to gather information on participants' awareness of teledentistry, perceptions of benefit and comfort using teledentistry and end-user level factors associated with the feasibility of using teledentistry in ARCs. Data were analysed using Stata SE 17.0 statistical software.

## Khac Truong Nguyen

Nguyen, K. T. (2022). Stereophotogrammetric analysis of lip changes induced by simulated incisor protraction

*Advisors: Mei, Peter; Farella, Mauro; Bennani, Vincent*

*Discipline: Orthodontics*

*Keywords: orthodontics; lips; perioral; soft tissue; protraction*

<http://hdl.handle.net/10523/14152>

Introduction: Incisor protraction can cause lip changes in three dimensional planes. Biomechanical properties of the lips may affect these changes. Aims: (1) To investigate the upper lip changes induced by the simulated incisor protraction; (2) To assess the influence of biomechanical properties of the lips on the induced lip changes. Materials and Methods: Incisor protraction was simulated by placing a stent covering the maxillary incisors (4 mm thickness) and gingiva (2 mm thickness). Lip changes in 3D were measured with stereophotogrammetry utilising 3dMD scanning technology. Biomechanical properties of the lips, including muscle tone, stiffness, and elasticity, were measured by myotonometry, using a non-invasive digital palpation device (Myoton AS, Estonia). Results: An average of 2 mm displacement was observed in the upper lip with 4 mm simulated protraction in the sagittal plane. A large inter-individual variation of displacement of lip were observed. Participants of some ethnicity demonstrated less displacement of the upper lip, after adjusting for body mass index. High lip tone and low elasticity were associated with greater displacement of the upper lip in the sagittal direction. Conclusions: Lip changes induced by the simulated incisor protraction differed among the participants with different BMI, ethnicity, and lip biomechanical properties (tone and elasticity).

## Nicholas Pittar

Pittar, N. P. (2022). Effect of passive clear aligners on masticatory muscle activity in adults with and without high oral parafunction

*Advisors: Farella, Mauro; Firth, Fiona*

*Discipline: Orthodontics*

*Keywords: Clear Aligners; Masticatory Muscles; TMD; Muscle Activity; Oral Parafunction*

<http://hdl.handle.net/10523/14141>

Aim: This study aimed to determine the short-term effect of passive clear aligners (PCAs) on masticatory muscle activity (MMA), occlusal discomfort (OD), and temporomandibular disorder (TMD) symptoms

in adults with high or low levels of self-reported oral parafunction.

**Methods:** University students were screened for oral parafunctional behaviours using the oral behavioural checklist. Respondents in 85th and 15th percentiles were invited to participate. The final sample consisted of 31 individuals: 15 with high parafunction (HPF) and 16 with low parafunction (LPF). Selected participants underwent evaluation of their temporomandibular joints, vertical facial proportions, and hypervigilance. Digital intraoral scans were used to fabricate PCAs. MMA was assessed three times over nine days using a portable electromyography device connected wirelessly to a smartphone. A control recording without PCAs in situ was followed by recordings on Day 1 and Day 8 of PCA wear. Participants' OD, free-way space (FWS), stress, and TMD symptoms were monitored. Results were analysed using descriptive statistics and linear mixed modelling.

**Results:** PCAs were associated with a significant decrease in mean contraction episode amplitude in both groups ( $p = 0.003$ ). No significant changes in mean contraction episode duration or frequency were observed between the two groups over time. OD increased in all participants on insertion of the PCAs ( $p < 0.001$ ), with a significant interaction between 'group' and 'time' ( $p = 0.048$ ) indicating that the perceived discomfort while wearing the aligners over time was significantly greater in the HPF than the LPF group. The HPF group had higher reported TMD symptoms at baseline and on day 8 of aligner wear ( $p < 0.004$ ), they also had higher somatisation questionnaire scores ( $p = 0.006$ ). Lower anterior facial height was greater in the LPF group ( $p = 0.015$ ). No significant changes in FWS, stress, or TMD symptoms were identified during the study period.

**Conclusions:** PCAs were associated with a decrease in MMA in all participants. People with high self-reported oral parafunction are more hypervigilant and reported greater discomfort when wearing PCAs than those with low self-reported oral parafunction.

### Jesslyn Praganta

Praganta, J. (2022). Clinical effects of advanced platelet-rich fibrin (A-PRF) on the outcomes of third molar removal surgery

*Advisors: De Silva, Harsha; Thomson, Murray; De Silva, Rohana; Tong, Darryl*

*Discipline: Oral Surgery*

*Keywords: Advanced platelet-rich fibrin; third molar surgery; pain; swelling; oedema; third molar removal*

<http://hdl.handle.net/10523/14151>

**Background:** Pain, swelling and alveolar osteitis are

commonly associated with the surgical removal of impacted third molars. Minimising these will optimise recovery and allow earlier return to normal functions, thereby improving patients' quality of life. Platelet-rich fibrin (PRF) is an autologous platelet concentrate proposed to reduce postoperative third molar complications such as pain, swelling and alveolar osteitis. In addition to being relatively cheap, simple and non-invasive to perform, PRF is an acceptable alternative to animal-derived products. While the literature indicates favourable findings of PRF use in third molar surgery, the data remains inconclusive. Surgical removal of impacted third molars will be referred to as "third molar surgery" for the remainder of this thesis.

**Objectives:** To investigate the clinical effects of intraoperative use of advanced platelet-rich fibrin (A-PRF) on postoperative pain and facial swelling after third molar surgery.

**Methods:** This study was a single-centre, single-blind, randomised, placebo-controlled trial involving 70 participants with symmetrical mandibular third molar impactions. They were randomly assigned an ID number, determining each participant's intervention and control side for this split-mouth design. The participants' third molar surgeries were performed under local anaesthesia with IV sedation under standardised conditions with an identical surgical approach. Premedication consisting of 40mg parecoxib, 8mg dexamethasone and 30µg fentanyl was administered to each participant. Following the third molar removal, the intervention socket was dressed with an A-PRF plug and SurgisponTM, while the control socket only received SurgisponTM. The blinded participants completed a 7-day diary to record their postoperative pain on the visual analogue scale (VAS) and their facial swelling on a 5-point ordinal scale. They were also assessed clinically for postoperative complications on days 2 (D2) and 7 (D7). In addition, 3D stereophotography images were taken using the 3dMDtrioTM system on D2 and D7. Comparisons were made against baseline measurements taken preoperatively on surgery day to calculate the volumetric changes. Ancillary data from this study include information on dental anxiety and participants' oral health-related quality of life.

**Results:** There were no differences in the mean VAS scores and facial volumes between the two sides across the seven days. Participants from both sides did not develop any alveolar osteitis; thus, there was no difference in the incidence between the A-PRF and control sides. Qualitative data analysis showed a higher proportion of the A-PRF side being 'pain-free' and 'swelling-free' on D2 than the control side, but the results were not statistically significant.

**Conclusions:** The use of A-PRF in third molar sockets did not appear to confer an additional reduction in postoperative pain and swelling when other

preventive strategies like pre-emptive analgesia and corticosteroid administration have been employed. Improvements shown through qualitative data merit further research to explore its potential benefits in compromised healing environments .

### Nigel Tan

Tan, N. R. (2022). A comparison between knotless and conventional sutures: A novel approach to third molar surgery

*Advisors: Tong, Darryl; Thomson, Murray; De Silva, Harsha; De Silva, Rohana Kumara*

*Discipline: Oral Surgery*

*Keywords: knotless sutures; barbed sutures; v-loc; OHIP-14; third molar surgery*

<http://hdl.handle.net/10523/14153>

**Aims/objectives:** The aim was to compare the performance of knotless sutures (3-0 V-loc™ 90) against conventional suture closure (3-0 Vicryl Rapide™) in the surgical removal of bilateral similarly impacted mandibular third molars. Specific objectives were to determine advantages in wound closure speed, postoperative pain, irritation and swelling.

**Methods:** The study was a single-blind, randomised controlled clinical trial using a split-mouth design. 70 participants were recruited from a source population of patients referred to the oral surgery service at the Dunedin School of Dentistry, University of Otago or to Southland Hospital Dental Unit, Te Whatu Ora Southern (formerly SDHB) by their primary care provider. The left or right mandibular third molars were randomly allocated to the proposed intervention (knotless sutures) and the control (conventional suture) to the other. A symptom diary was provided to record pain and irritation scores on each side using a 100mm visual analogue scale. Six pairs of scores were recorded over the first 48 hours by participants. Three facial measurements were taken to determine postoperative swelling: between the tip of the tragus and soft tissue pogonion (A); tragus and lateral corner of the mouth (B); lateral corner of the eye and the angle of the mandible (C) (Figure 9, p. 44). Changes between successive measurements of  $[(A + B + C)/3]$ , were expressed as a percentage (%). These were taken at baseline (Day 0), day 2 and day 7 postoperatively.

**Results:** The mean closure time for knotless sutures was 1 minute 23 seconds faster than for conventional sutures [ $F(1, 62) = 262.8, p < .001$ ], and the study average was 3 minutes. There were no statistically significant findings for postoperative pain, irritation and swelling.

**Conclusion:** Knotless sutures confer some performance benefits, but this needs to be weighed against the increased material cost. It is a promising approach to intraoral wound closure, due to its superior intraoperative handling and comparable postoperative performance.

### Sunethra Tennekoon

Tennekoon, S. C. (2022). Analysis of changes in saliva composition in patients with oral cancer and oropharyngeal cancer using Fourier transform infrared spectroscopy

*Advisors: Li, K.C.; Guan, G. Simon; Ting, Graeme*

*Discipline: Special Needs Dentistry*

*Keywords: FTIR; Saliva; Oral Cancer; Oropharyngeal Cancer*

<http://hdl.handle.net/10523/14174>

**Background:** Oral cancer (OC) and oropharyngeal cancer (OPC) make up 2-4% and 2%, respectively, of all cancers diagnosed in New Zealand. Late-stage diagnosis OC and OPC (Stage III or IV) is associated with 5-year survival rates ranging from 20% to 50%, depending on the site. In contrast, the prognosis of patients treated at an early stage (stage I or stage II) is a 5-year survival rate ranging from 60% to 80%. There is currently no non-invasive method or effective screening procedure available to diagnose oral and oropharyngeal cancer at the earliest stages when survival rates are higher.

**Aim:** This study aimed to show if Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy when applied to saliva samples, may be used as a sensitive, non-invasive, low-cost technique to screen for and diagnose OC and OPC at an earlier stage and thus increase the likelihood of survival, as well as observe the changes in saliva composition for cancer samples before and after cancer treatment.

**Methods:** Unstimulated whole saliva samples were collected from 8 individuals with OPC or OC and 8 healthy individual controls. The prepared samples were used to generate FTIR spectra within the wavenumber range of 400 cm<sup>-1</sup> to 4000 cm<sup>-1</sup>. Infrared spectra of the whole saliva for the healthy individuals (HI) and the cancer samples, before treatment (B-OC) and after treatment (A-OC), were compared for significant difference. Analysis was conducted for original average spectra data and Fourier deconvoluted average spectra data. Second derivative analysis was also used to identify peaks of interest, and curve-fitting analysis was carried out on the deconvoluted spectral data in order to identify differences between the intensities of the deconvoluted peaks and to identify differences

between areas under the peaks of interest for the three groups.

Results: No significant differences were detected between HI and B-OC groups for any of the analysis methods however, for the deconvoluted spectral data of the B-OC and A-OC groups, a significant difference ( $p < 0.05$ ) was noted for the wavenumber 524cm<sup>-1</sup> when the area under peaks and intensity of wave peaks were studied.

Conclusion: There was no identifiable difference in the HI and OC/OPC groups prior to oncology treatment thus suggesting that ATR-FTIR spectroscopy was not able to discriminate between these two groups.

The only significant differences noted in the saliva of OC/OPC cancer participants was after the cancer group received surgery or chemotherapy and radiotherapy, confirming the significant impact that cancer therapy has on saliva. Further analysis of FTIR spectroscopy when applied to saliva of OC and OPC patients needs to be carried out.

## Doctor of Dental Science (DDSc) abstracts

### Paul Brunton

Brunton, P. A. (2021). Improving the Evidence Base for Primary Dental Care

*Keywords: Primary; Dental; Care; Evidence; Base; Clinical; Trials*

<http://hdl.handle.net/10523/11957>

Primary Dental Care, where the majority of dentistry is provided, is an area that frequently lacks robust evidence to support clinical practice. Surveys of primary dental care practitioners (general dentists) were used to identify the clinical challenges they face and to focus research on the "gaps" in evidence to support best clinical practice. Using this information multiple, suitably powered, clinical trials were conducted, in partnership with primary dental care practitioners. The results of these trials were then used to develop clinical guidelines for practitioners so that a more evidenced based approach to providing dental care could be incorporated into clinical practice.

## Research Masters abstracts

### Master of Oral Health (MOH)

#### Yunsun Choi

Choi, Y. J. (2021). The work experiences of a cohort of New Zealand oral health therapists

*Advisors: Moffat, Susan; Meldrum, Alison*

*Keywords: Oral health therapist; New Zealand; Career pathway; Career satisfaction; Work experience; Workforce; Oral health therapy; Employment environment*

<http://hdl.handle.net/10523/12338>

Although only working in New Zealand communities since 2008, oral health therapists are a growing workforce and have a wider scope of practice than dental therapists or dental hygienists. This qualitative study explores the work experiences of the first Oral Health graduates (class of 2009) from the University of Otago, who were initially registered as dental therapists and dental hygienists with the Dental Council of New Zealand but are now registered as oral health therapists (since 2017). Six graduates from the class of 2009 participated in one-to-one interviews. The findings identified that their individual work experience varied depending on their career pathway, employment environment, work and lifestyle balance, and overall goals. Participants expressed a high level of satisfaction with their current jobs and with the Bachelor of Oral Health programme. Their employment environment has improved over time and participants have been able to achieve a good balance between work and lifestyle according to their personal preferences and circumstances. However, some lack of understanding of the oral health therapist's role and utilisation within private dental practice still exists. A limited number of participants, such as in this study, does not represent the perspectives of all oral health therapists in New Zealand; therefore, a further study involving New Zealand oral health therapists from all graduate cohorts from both the University of Otago and Auckland University of Technology is recommended.



## Master of Community Dentistry (MComDent)

### Manisha Narsinh

Narsinh, M. (2022). Dental treatment for children under general anaesthetic in Auckland 2007-2019

*Advisors: Broadbent, Jonathan; Thomson, W. Murray*

*Keywords: New Zealand; Auckland; dental caries; general anaesthetic; children*

<http://hdl.handle.net/10523/13790>

**Overview:** Dental caries is one of the most prevalent preventable diseases in childhood and dental treatment for children under general anaesthetic (GA) is one of the leading reasons for avoidable hospital admissions each year in New Zealand. A large group of children receiving such care reside in Auckland as it is the largest populated city in New Zealand and accounts for approximately one-third of New Zealand's population. Reports have indicated that the number of children who receive a dental GA is rising. Children residing in the most deprived areas are over-represented and often have more teeth affected by dental caries than those from least deprived areas; however, little is known if this has changed in recent years, particularly in the Auckland region. Ethnic inequalities exist, and Māori children have been disproportionally represented, but there is little published data about Pacific children who receive such care and the types of treatments they have despite knowing that this group has a high caries experience. Auckland has a multicultural population and a large population of children born overseas, and yet little is known about other ethnic groups who have received a dental GA. Few published studies have reported on repeat GA rates among New Zealand children but there are no recent reports and no published data for the Auckland region.

**Aims:** The aims for this study were for the Auckland region from 2007 to 2019: (1) to describe any changes observed in the number of dental GA cases carried out annually; (2) to describe the demographic characteristics of children who received dental treatment under GA; (3) to identify and describe any changes in the type and amount of dental treatment provided under GA; (4) to determine the number and characteristics of children who have had multiple dental GAs; (5) to describe any changes observed in the number of overseas-born children who received dental treatment under GA.

**Methods:** Hospital admission data for children treated at Auckland District Health Board aged 0-17 admitted under Hospital and Specialist Dentistry for dental treatment under GA from 1st January 2007 to 31st December 2019 were obtained from an Auckland District Health Board dataset. Each entry in the dataset corresponded to a single hospital admission and included demographic details, birth country,

American Society of Anesthesiologists (ASA) physical status classification system codes, diagnosis, and procedure codes. Data were reported descriptively with population rates calculated using Statistics New Zealand population estimates for the years in question.

**Results:** During the 13-year period, 22,550 children and adolescents aged 0-17 years were treated. The number of GAs carried out increased by 17.6% from 1,843 in 2007 to 2,167 by 2019. The proportion of children admitted aged 0-4 decreased from 44.9% in 2007 to 33.1% in 2019 while an increase was observed among children aged 5-9 from 45.9% to 55.4%. Close to one in three admissions were for Pacific children while one in five were for Māori. Ethnic disparities were evident in the rate of admissions per 1,000 children among those aged 0-4 and 5-9 with admissions being lowest among European children. Almost half of those treated resided in the most deprived quintile. The proportion of children treated who were born overseas decreased from 16.6% in 2007 to 12.5% in 2015 before increasing again to 17.2% in 2019. Overseas-born children had more teeth extracted per child than New Zealand-born. The rate for children who received stainless steel crowns more than doubled among children aged 0-4 and increased five times among those aged 5-9. An increase was also observed in the average number of stainless steel crowns and extractions per child aged 0-4 and 5-9 among children of all ethnic groups. During the study period, 2,160 children received at least one repeat GA. The rate of repeat GAs within four years of the initial GA decreased markedly from 16.3% where the first procedure was in 2007 to 5.6% in 2016. The relative risk of Pacific children receiving a second or third GA was significantly lower than for European children, while children of Māori, Asian, and MELAA ethnicities were at a significantly lower risk of receiving a third GA. Children with moderate to severe medical comorbidities were 4.6 times more likely than healthy children to receive a second GA and 33.9 times more likely to have three or more GAs.

**Conclusions:** This study confirms that the number of children who receive dental treatment under GA in Auckland has continued to increase. Ethnic and socioeconomic disparities have persisted and may have widened. The treatment provided under GA has changed with an increase in the number of children receiving stainless steel crowns and an increase in the average number of stainless steel crowns and extractions received per child indicating that the severity of caries may be increasing among those who need treatment under GA. The rate of repeat admissions within four years of initial GA has decreased and this is encouraging from the child and service perspective. Improving the oral health of New Zealand children should be a priority at policy level to reduce the burden on hospital dental services. Upstream interventions and policy changes are needed to make any meaningful difference.



# SJWRI Research Report 2021-2022

was compiled, designed and edited by SJWRI Research Manager, Dr James Smith.

[otago.ac.nz/sjwri](https://otago.ac.nz/sjwri)

