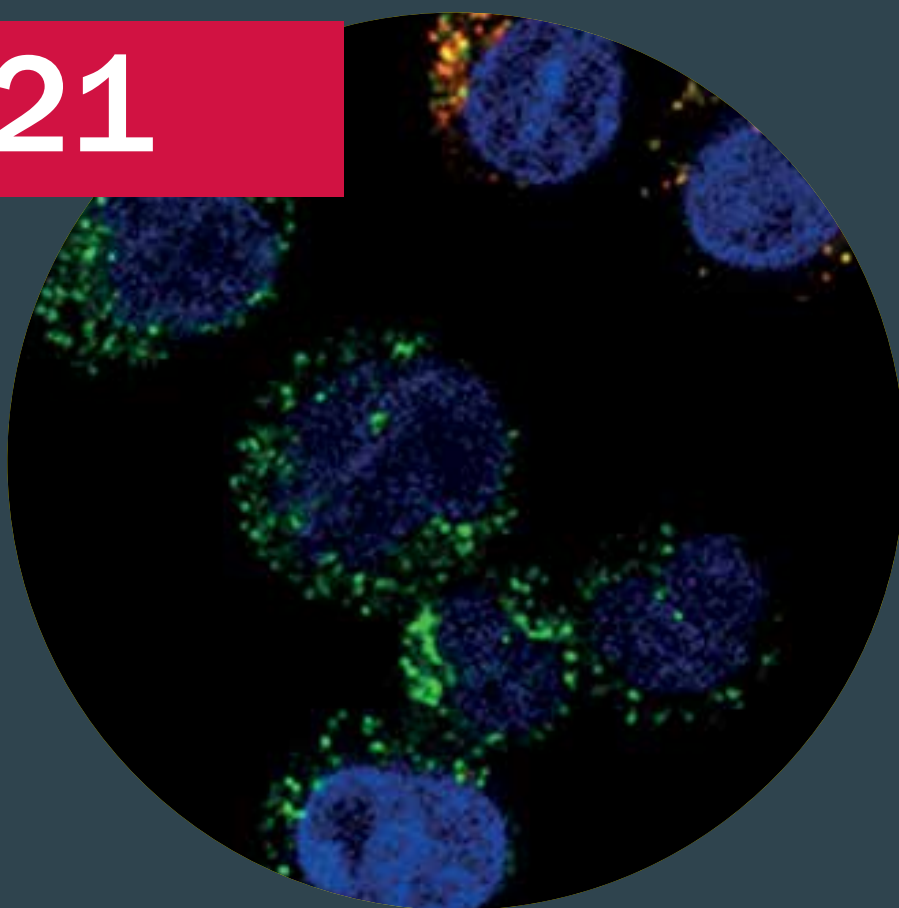


ANNUAL RESEARCH REPORT

for 2021



Contents

Foreword	3
Research Impact	4
Research Group – Matrix Biology and Tissue Repair	7
Research Group – Advanced Therapies	10
Research Group – Microbial Diseases	13
Research Group – Regenerative Biology	16
Research Group – Dental Public Health	20
Research Group – Orthodontics and 3D Imaging	23
Research Group – Alcohol and Violence	26
Research Group – Improving Dentistry	29
Research Group – Dental Education and Scholarship	32
PhD successes	35
Awards and Honours	36
Research Funding	37
International Collaborators	38
Publications	40



Cover image: Intracellular distribution of Alexa-594-labelled Colistin-Dextran conjugate (red) in THP1 cells. Endosomal compartments were labelled with Dextran-Alexa-488 (green) and the nuclei were stained with DAPI (blue). Sian Rizzo (post-doctoral researcher, Advanced Therapies Group) investigated the uptake and intracellular fate of novel drug conjugates with the aim of targeting leukaemia cell lines. Here, the conjugate transitioned through the endosomal pathway to lysosomes. Modification of the dextran reduced total uptake of the conjugate, compared to colistin alone, but did not prevent accumulation in the lysosomes.

Professor Nicola Innes
Head of School



I am delighted to be able to present to you, our Annual Research Report for 2021.

The researchers in our School have been negatively impacted by direct challenges related to COVID that have obstructed and slowed down the pathway to carrying out research. These include homeworking, limitations on access to environments and research participants; less face-to-face contact with immediate and distant colleagues and networks; and the diversion of attention to important dependent care that continues to be unpredictable and demanding. There have also been the indirect challenges that have meant financial difficulties with increasing costs of materials and delays in fulfilment of orders and their delivery.

Despite these significant barriers, we have not only continued to progress ongoing work but have also forged ahead with grant applications, innovative research and making impact.

For such a small School we punched well above our weight with the number of impact case studies we were able to put forward to the University for the Research Excellence Framework 2021 assessment exercise and, ultimately, had accepted to be submitted as examples of the work our University does. We await the outcome of that process and expect to hear in May this year.

Professor Daniel Aeschlimann was generous enough to continue over the proscribed term as Director of Research to ensure our REF submission was optimal and see us through COVID challenges. He did this as well as leading across the whole Unit of Assessment 3 submission. The School, and I, are very grateful for his motivation, leadership and support over the years. I am delighted to welcome our new Director of Research, Dr Elaine Ferguson, who has taken over the reins of some of the ongoing projects that Professor Aeschlimann was leading, including scrutinising our research portfolio. There have been several retirements and changes in staff that make it timely to consider our profile of activity. As part of this, we have removed the separation of research groups under themes and are working to increase collaboration across the School. Another change is that, for the first year, we have included our research related to Education and Scholarship within the brochure and we expect to also see activity in this area grow over the next few years.

So, all in all, this has been a very active year for the School. We remain responsive to the environment and the society we serve with our enquiry-based activity and look forward to sharing further impactful research as we continue to seek out, and address, important questions to improve the world around us.

Foreword

Dr Elaine Ferguson
Director of Research



It is my pleasure to introduce the 2021 edition of the Cardiff University School of Dentistry Annual Research Report. This report outlines the key strategic areas and important discoveries of our research programmes over the last year and highlights the breadth and depth of the research conducted in our School.

The COVID-19 pandemic has continued to profoundly affect staff, students and the wider society that we are part of and for whom we aim to deliver health and wellbeing improvements through our research. Nevertheless, even in the face of unprecedented challenges and societal change, our researchers have accomplished a lot, including successful funding applications and PhD awards, many high-impact research publications and new collaborations. Of note, Professor Ivor Chestnutt was part of a team of investigators who were awarded £1.2M from the Welsh Government to establish the Wales Centre for Primary and Emergency Care Research (PRIME). Professor Nicola Innes was a co-applicant on a £1.5M NIHR HTA award for the CALM Trial, which will assess the clinical and cost-effectiveness of a guided self-help cognitive behavioural therapy intervention to reduce dental anxiety in children. Dr Ryan Moseley received £298K from the Dunhill Medical Trust to develop epoxy-tiglanes as novel small molecule therapeutics for impaired re-epithelialisation associated with non-healing, chronic skin wounds in the aged.

The past year has continued to see our researchers rising to the challenges brought about by COVID-19 as they applied their expertise in clinical practice, immunology and medical statistics to tackling the pandemic. Examples of some of our COVID-19-related research are given on pages 5 and 6. Additionally, the Violence Research Group has studied the effect of COVID-19 lockdowns on assault-related attendances to the emergency

unit in Cardiff, the Clinical Dentistry group has contributed to increasing our understanding of the risk of contamination in relation to periodontal care procedures relevant to COVID-19 and the Microbial Diseases group has investigated the clinical and microbiological profiles of patients co-infected with COVID-19.

This year also saw the successful submission to the REF2021. As part of Unit of Assessment 3 (Allied Health Professions, Dentistry, Nursing and Pharmacy), we submitted 100% of T&R staff with at least 1 output each to the REF2021. In total, we submitted 55 research outputs and 3 impact case studies, whose effects were felt around the world. We are now actively pursuing the plans outlined in the Unit's environment statement as we eagerly await the results in May2022. I would like to thank all our dedicated academic staff for their world-class contributions to the submission, as well as our professional and technical services staff for their valued insights and support.

Among the notable publications for this period were the following studies:

- **Professor Simon Moore** and collaborators' research article in the International Journal of Intercultural Relations has challenged commonly-held perceptions about student alcohol intake during study abroad experiences, indicating that moderate drinkers are at greatest risk of transitioning to heavy drinking as they travel abroad.
- A research article in Nanoscale, involving **Dr Petros Mylonas**, explored the potential of calcium phosphate nanoparticles as enamel remineralising agents and demonstrated the suitability of hydroxyapatite discs as an alternative substrate model to human teeth.
- Research by the **Advanced Therapies Group** was published in mSphere, showing that long-term exposure of bacteria to the alginate oligomer, OligoG CF-5/20, resulted in fewer colonies with multidrug resistance (MDR)-associated phenotypes and improved antibiotic susceptibility of *P. aeruginosa*, in the absence of any adverse effects.
- **Professor Nicola Innes** led a Cochrane Review with colleagues from around the world finding that less invasive treatment options for primary and permanent teeth with cavitated or dentine lesions were as successful or more successful than traditional invasive treatment.
- A collaboration with colleagues from the Association for Dental Education in Europe (ADEE) network, led by **Dr James Field**, reported that there is a widespread need for teaching materials relating to environmental sustainability in the modern dental curriculum. The article presenting the findings was published in the European Journal of Dental Education.

with me and my colleagues in the Senior Leadership Team, who have encouraged me and shared my vision for the future of research in the School.

In 2021, we bade farewell to two longstanding colleagues: Mrs Maria Morgan and Professor Mike Lewis. Maria retired from her position as a senior lecturer in dental public health in July. During her 23 years in the School, Maria led the Welsh Oral Health Information Unit to plan and deliver the NHS Dental Survey Programme for Wales. Mike, who was Head of School between 2010 and 2017, retired in August. His clinical- and laboratory-based research in oral medicine focussed on the effects of bacterial, viral and candidal infections on the orofacial tissues. Leadership roles in the School have also changed in 2021. Professor Daniel Aeschlimann's term as Director of Research came to an end and I was appointed to the role in September 2021. I would like to close by thanking everyone who has supported my transition to this role, especially Daniel, who shared his wisdom, insight and vast experience

Case Study 1:

The Graduating European Dentist and Hygienist

- Dr James Field

Over the past 5 years, staff at Cardiff have been instrumental in leading pan-European taskforces for writing modern curricula for both the graduating European Dentist (GED) and Hygienist. The last time that the European curriculum for dentistry was updated was in 2010, and this is the first time that a European curriculum for hygiene has ever existed

The new curricula provide clear guidance and support for dental education and training on a European scale, and the new frameworks will:

- Further refine and harmonise oral health professional undergraduate curricula across Europe, whilst respecting regional, socio-economic and cultural variation.
- Reinforce the importance of an outcome-based curriculum, which is informed by a robust and effective system of student and staff feedback.
- Facilitate the transition from a student to a practitioner who is considered, as a minimum, “a safe beginner,” and able to build confidence and further competence as part of a workplace-based training programme.

- Provide a clear framework that is accessible to all stakeholders of oral health professional undergraduate education, including students themselves.
- Enhance patient safety through a high standard of clinical and professional care on a European and global level.
- Provide guidance and support for educators who are developing curricula for undergraduate dental education and training.

The curricula were developed through widespread consultation, and consensus, with educators and their respective institutions, regulators, professional societies, trade unions, students, and industrial partners. Since their open access publication in 2017 (Dental) and 2020 (Hygiene) the curriculum documents have been cited over 200 times and now form the basis for various regulatory curricula across Europe.

The GED documentation has been digitised and now has a home online (<https://adee.org/projects/graduating-european-dentist/graduating-european-dentist-resource-pages>) where you can search and comment on the curriculum.

The European Dental Hygiene Foundation curriculum task force (Dental Hygiene) at one of its meetings in Amsterdam.



Members of the GED task force (Dentistry) at one of their meetings in Dublin.



Case Study 2:

Providing evidence for the role of mouthwash as a SARS-CoV-2 risk mitigation strategy in dentistry

- Professor David Thomas

Since the outset of the pandemic, we have been working with colleagues in the Systems Immunity University Research Institute (Prof Valerie O'Donnell and Dr Richard Stanton). Our initial interests were in the potential for reduction of SARS-CoV-2 in saliva using mouthwashes to disrupt the viral lipid envelope. We participated in an international review of the evidence in Function (<https://doi.org/10.1093/function/zqaa002>). Following this, we demonstrated rapid, virucidal (>104-fold reduction) effects of selected mouthwashes against SARS-CoV-2 *in vitro* (<https://doi.org/10.1101/2020.11.13.381079>).

We next sought to study the impact of mouthwash, including duration of effect, on virus infectivity in patients, in a randomised controlled trial in hospitalised COVID patients across Wales (MOMA; ISRCTN25647404). This was conducted at University Hospital Wales, with Ceri-Ann Lynch (Cwm Taf Morgannwg University Hospital Board), Arvind Arya (Betsi Cadwaladr University Health Board) and their teams. The manuscript is currently under revision. In parallel with this work, the O'Donnell and Stanton groups, undertook the first detailed characterisation of the viral lipid envelope to better understand the unique features of the disease process. This work led to a £606K research grant from BBSRC (BB/W003376/1; O'DONNELL PI); mapping the lipid envelope composition of SARS-CoV-2 and studying how this modifies inflammation, thrombosis and infection. As part of this grant, working with Public Health Wales, we established a community-based (Cwm Taf Morgannwg UHB) and hospital-based study in COVID patients in Cardiff and Vale, Aneurin Bevan- and Betsi Cadwaladr University Health Boards (AVECO; ISRCTN 54053617).

Clinically, at the height of the pandemic in June 2020, we worked with the Chief Dental Officer; employing mouthwash as part of risk mitigation in a 'Protocol of return to practice of routine dental care'. A pilot scheme introduced a reduced fallow time from 60 to 20 minutes; incorporating mouthwash alongside routine Infection Prevention Control policy in 5 dental practices across South-East Wales. Patient outcomes were monitored at 14 days post-treatment. Between June and August 2020 >6400 patients were treated with this protocol. This data reinforced our confidence in the safety of the cross-infection measures adopted in dental practice in the pandemic. The laboratory and clinical evidence on the mouthwash we generated led to oral-rinsing being adopted into routine patient care in the Salisbury NHS Trust

(<https://www.salisbury.nhs.uk/coronavirus/covid-19-mouth-care/>).

In moving forward, a generous award from the Garner Roberts Charitable Trust Fund is supporting Prof Thomas and Dr Nick Claydon's ongoing collaboration with colleagues in the Schools of Biosciences (Berube/Jones), Architecture (Lannon), Medicine (Roberts, McLeod) and Engineering (Giles) to better understand the relationship between aerosol decay and the built environment, to inform safe practice. Alongside this, with industrial partners, Professor Thomas, Dr Katja Hill and Dr Richard Stanton are also working in the laboratory to understand the potential of over the counter anti-viral and anti-microbial therapies.

Case Study 3:

COVID Bereavement Study

Dr Damian JJ Farnell,
Dr Renata Medeiros Mirra
(Study statisticians for the COVID bereavement study)

282 million confirmed COVID-19 cases and 5.4 million deaths from COVID-19 have occurred globally as of the start of the New Year in 2022. Each death is associated with approximately nine close bereavements. The UK COVID bereavement study investigates the impact of the COVID-19 pandemic on the experiences of the bereaved and on bereavement support provision. The main investigators for this study are Dr Emily Harrop at University of Cardiff and Dr Lucy Selman at the University of Bristol.

People who were bereaved during the first wave of the pandemic completed an online questionnaire detailing their experiences, where 44% of the deceased died to (known or suspected) COVID-19 and the rest died of other causes. 51.6% of 711 bereaved people demonstrated high or severe levels of grief. They also experienced very high levels of pandemic-related challenges (see table) and they needed high levels of support (see figure). Qualitative analysis of free-text survey data from bereaved participants identified the main themes that related to challenges of bereavement. A quote from this work encapsulates the experiences of many of the bereaved:

Table: Frequency of pandemic-related challenges experienced by the bereaved before or after the death during the first wave of the COVID-19 pandemic.

“It was brutal. It still is, as I feel the grieving process is so much worse now due to isolation and lack of contact and the trauma of [Name]’s sudden death and not having any time with him. I tell people that unless you have lost someone you love so much suddenly, during this pandemic, you can never understand the feelings of hopelessness, despair, sadness, so much was ripped away from me and my children.” (Bereaved wife)

Findings from the study were presented at the launch of the UK Commission on Bereavement in June 2021 with a public statement by the Minister for Mental Health to address the gaps and challenges identified by the study. For more information, please see recent TV news coverage with Dr Lucy Selman [https://youtu.be/Z5hDtmEkrnM and https://youtu.be/O2MWuVs3PMM] and a statement by the medical schools council into UK universities’ research into COVID-19.

The COVID bereavement study will now focus on the long-term effects of bereavement and on the impact of COVID-19 on services, including key adaptations, challenges and approaches to delivering accessible bereavement care during pandemics.

	Percentage	95% CI
Unable to visit them prior to their death	54.30%	50.5% to 58.0%
Limited contact with them in last days of their life	57.80%	54.1% to 61.5%
Unable to say goodbye as I would have liked	63.90%	60.2% to 67.4%
Restricted funeral arrangements	93.40%	91.3% to 95.1%
Social isolation and loneliness	66.70%	63.1% to 70.1%
Limited contact with other close relatives or friends	80.70%	77.6% to 83.6%

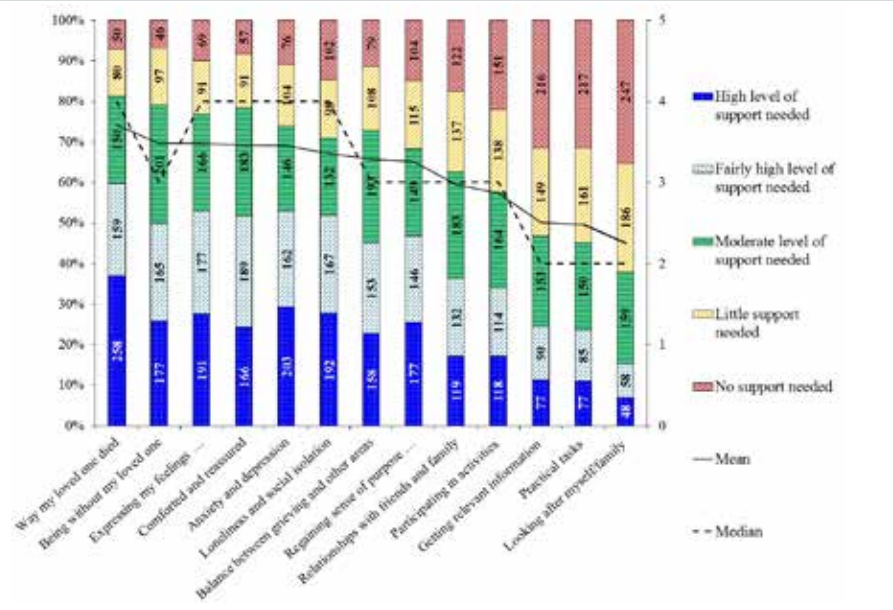


Fig 1. How much support bereaved persons felt they needed on a range of issues relating to their bereavement during the first wave of the pandemic*. (Scale for means and medians on the axis on the right-hand side of the figure: 1 = no support to 5 = high level of support needed).

*These issues were: Dealing with my feelings about the way my loved one died; Dealing with my feelings about being without my loved one; Expressing my feelings and feeling understood by others; Feeling comforted and reassured; Feelings of anxiety and depression; Loneliness and social isolation; Finding balance between grieving and other areas of life; Regaining sense of purpose and meaning in life; Managing and maintaining my relationships with friends and family; Participating in work, leisure or other regular activities (e.g. shopping, housework); Getting relevant information and advice e.g. legal, financial, available support; Practical tasks e.g. managing the funeral, registering the death, other paperwork etc.; Looking after myself/family e.g. getting food, medication, childcare

Matrix Biology and Tissue Repair

We are a multidisciplinary team of scientists with expertise in cell and molecular biology, structural biology, and immunology. Our research aims to understand and manipulate the interface between extracellular matrix (ECM) and the diversity of cells in the craniofacial complex.

www.cardiff.ac.uk/research/explore/research-units/matrix-biology-and-tissue-repair-research-group

Our goals are:

- To elucidate and counteract pathological processes leading to tissue destruction in inflammation, cancer and ageing.
- To create functional tissue through application of life science principles.

The ECM and its interaction with various cells are critically important to regulate inflammation, repair/regenerative processes and invasive cancers. Connective tissue cells control migration, survival and proliferation of endothelial and epithelial cells as well as recruitment and activation of antigen presenting cells that orchestrate the inflammatory response. Altered connective tissue cell responses are associated with many diseases, because of either direct involvement in the aetiology or because of fibrosis, which accompanies the tissue damage. Experimental models have been established within the group to decipher cellular interactions regulating distinct aspects of the repair and disease process. These relate to inflammation, angiogenesis, re-epithelialisation, cancer stromal cell interactions and ECM changes occurring with ageing. The emphasis is to gain a molecular understanding of the role of post-translational modifications of proteins in organ system function, and how aberrant protein modifications or proteolysis contributes to pathogenesis.

Highlights of 2021:

- Work led by Dr Dewitt and Prof Aeschlimann has resulted in successful immortalization of human chondrocyte progenitor cells. These new stem cell lines are capable of generating tissue with striking similarity to native human cartilage. This work was presented at the British Orthopedic Research Society 2021 meeting, and an ongoing collaboration with Exeter University is using these cells to ask exciting questions about detailed cartilage organization and development.
- Continued collaboration between Dr Beck and the groups of Drs. V. Bauerová-Hlinková and M. Kúdelová (Slovak Academy of Sciences, Bratislava, Slovakia), determined the effect of two mutations within the M3 gamma herpesvirus 68 protein, selected based on molecular modelling, on its interaction with various chemokines (CXCL8, CCL2, CCL5, CCL11). Preliminary data suggest that specific electrostatic interactions involving residues Glu70 and Lys282 play a crucial role in M3-chemokine complex recognition. We expect further insight from co-crystallization experiments.
- Ongoing collaborative work between Prof Ager and Dr Knäuper received extended funding from UKRI to continue work on “The regulation of protective immunity to viruses by L-selectin.”.
- Despite the ongoing challenges caused by COVID-19, the Cardiff SwitchSENSE facility for the analysis of biomolecular interactions established with EPSRC funding by Professor Aeschlimann and colleagues (B. Bax, Medicines Discovery Institute, Biosciences; N. Buurma, Chemistry) is now operational. This unique facility for comprehensive biophysical characterization of interacting molecules is now supporting our drug discovery efforts in Cardiff and beyond and is pursuing projects on nucleic acid-based therapeutics.

Our plans for 2022

- A novel collaboration with industry will explore gut-microbiome interactions.
- We will apply our expertise in cartilage engineering to develop models mimicking the multi-scale hierarchical changes in matrix organization that reflect joint specificity and genetics.
- Develop a microfluidic tissue platform for modelling complex vascular and immune functions in the context of recently established cross-HEI collaboration (Organ-on-a-Chip Technologies Network).
- Regulation of c-MET signalling in oral cancer by small bioactive molecules and metalloproteinases will be further explored as new therapeutic approaches.
- Based on analysing the structure and site-directed mutagenesis of murine gamma-herpesvirus 68 M3 protein we will further our understanding of its influence on inflammatory diseases and cancers arising from dysregulation of the host chemokine network.

Key project summary:

Cell surface topography controls phagocytosis and cell spreading: The membrane reservoir in neutrophils

Al-Jumaa M et al, 2020 *Biochimica et Biophysica Acta (BBA) - Molecular Cell Research* 12: 118832

Background:

Neutrophils are the main innate immune cell recruited to the oral cavity. They provide the first line of defence against invading pathogens, ensuring a healthy periodontal tissue. In chronic inflammatory diseases such as periodontitis however, excessive neutrophil accumulation leads to periodontal tissue damage, and in severe cases, bone loss. Understanding the mechanism of action of these powerful cells, is therefore key to promoting and controlling a healthy oral environment.

Neutrophils exhibit dramatic and rapid cell shape changes as they spread onto surfaces (e.g. when they transit through blood vessels to tissue sites) or undergo phagocytosis of pathogenic material. These shape changes require a large apparent increase in the cell surface area (about 200–300% of the initial cell surface area), however the total amount of plasma membrane remains stable. We therefore hypothesised that the 'wrinkled' cell surface topography of neutrophils could be important in providing the reservoir of membrane required for cell spreading and phagocytosis.

Discovery:

Advances in monitoring cell surface topography in living cells enabled us to test this hypothesis. We manipulated the cell surface topography and cell behaviour, while using

a technique named subdomain fluorescence recovery after photobleaching (sdFRAP). This measures the kinetics of fluorescence recovery at a locus remote from the bleach front. By comparing with the kinetics expected from a flat surface, the wrinkledness of the diffusion path can be established (Al-Jumaa, 2017).

Osmotic shrinking of neutrophils produced hyperwrinkled cells, which were unable to spread normally or undertake phagocytosis. Triggering a Ca^{2+} signal in osmotically shrunk cells (by IP3 uncaging) evoked tubular blebs instead of full cell spreading. During phagocytosis, inducing osmotic shrinking after the phagocytic Ca^{2+} signal had initiated, halted the event at the phagocytic cup stage. Restoration of iso-tonicity was able to restore complete phagocytosis.

Importance:

These data provide new evidence that the wrinkled surface topography of neutrophils provides the membrane reservoir for the large apparent increase in cell surface area. From this work we can conclude that neutrophils use this approach over the slower and more energy expensive exocytosis and endocytosis mechanism which other cell types may use, enabling their rapid spreading and high phagocytic capacity.

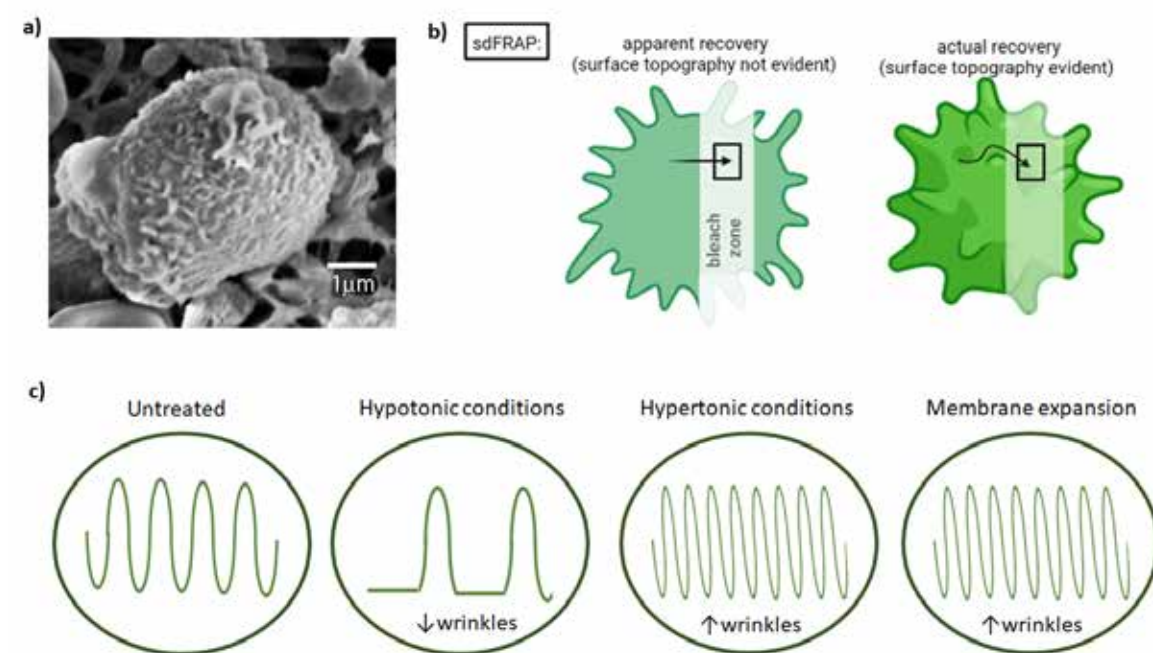


Figure 1: Cell surface topography changes detected by sdFRAP and Scanning Electron Microscopy (SEM). a) SEM of an untreated neutrophil showing wrinkled membrane. b) The diagrams illustrate the principle of sdFRAP applied to a fluorescently labelled cell membrane. The diffusion pathlength of membrane associated molecules are determined by the kinetics of increase in fluorescence within the subdomain within a bleached area. This depends on the diffusion distance. By comparing the kinetics expected from a flat surface (left image) with that actually recorded (right image), the degree of surface wrinkledness can be estimated (image created in Biorender). c) Schematic representation of the calculated measure of 'wrinkledness' (w), determined by sdFRAP following osmotic manipulation (hypotonic (50% isotonicity), $w=1$; hypertonic (isotonic plus 300mOsm NaCl), $w=4.3$) or chemical membrane expansion (deoxycholate 0.4 mM), $w=4.3$, compared to control conditions, $w=2.7$.



Professor Daniel Aeschlimann

✉ AeschlimannDP@cardiff.ac.uk
☎ +44 (0)29 2074 4240

MSc (Biochemistry, Biophysical Chemistry, Cell Biology and Molecular Genetics), 1990, Biocenter, University of Basel, Basel, Switzerland. PhD (Biochemistry), 1993, University of Basel, Basel, Switzerland. Fellowships from EMBO and Swiss National Science Foundation. Various academic positions in Switzerland, USA and UK. Since 2001,

Professor of Biological Sciences, Cardiff University, UK. Head of Matrix Biology & Tissue Repair Research Unit and until September 2021, Director of Research for School of Dentistry.

The function of transglutaminases and protein crosslinking in physiological processes and in disease has been a central theme of my research. Current research focuses on the role of transglutaminase enzymes in innate immunity and the development of autoimmune disease within the context of gluten sensitivity and arthritis.

Key Publication:

Schulze-Krebs A, et al. (2021). Transglutaminase 6 is colocalized and interacts with mutant Huntingtin in Huntington disease rodent animal models. *Int J Mol Sci* 22(16): 8914.

Full list at: www.cardiff.ac.uk/people/view/39472-aeschlimann-daniel



Dr Konrad Beck

✉ BeckK@cardiff.ac.uk

Diploma in Physics, 1981 JWG University Frankfurt a. M., Germany. Ph.D. in Biology, 1984, MPI Biophysics, Frankfurt a. M., Germany. Habilitation (DSc) in Biophysics, 1990, University Linz, Austria; various academic positions and fellowships in Basel, Switzerland; Linz, Austria; Portland OR, USA; Piscataway NJ, USA; Nagoya, Japan; Lyon, France; since 2004 Lecturer in Protein Biophysics, Cardiff University, U.K.

My main work relates to the structure, folding and assembly of multidomain proteins, especially those of the extracellular matrix. International collaborations with the groups of Patricia Rousselle (IBCP C.N.R.S., Lyon, France) focus on the role of laminins in cancer; with the groups of Marcela Kúdelová and Vladena Bauerová-Hlinková (Slovak Academy of Sciences, Bratislava, Slovakia) on critical mutations involved in chemokine binding in a Herpesvirus protein; and with the groups of Amandine Bovay (University of Basel, Switzerland) and Silvia Fuertes Marraco (Lausanne University Hospital, Lausanne, Switzerland) on the function of yellow fever virus epitopes.

Key Publication:

Bovay A, et al (2020). Identification of a superagonist variant of the immunodominant Yellow fever virus epitope NS4b214-222 by combinatorial peptide library screening. *Molecular Immunology* 125: 43-50

Full list at: www.cardiff.ac.uk/people/view/39468-beck-konrad



Dr Sharon Dewitt

✉ Dewitt@cardiff.ac.uk
☎ +44 (0)29 2251 0665

BSc (Pharmacology, University of Wales College of Medicine), PhD (Cell Biology & Immunology, Cardiff University), Wellcome Trust funded postdoctoral researcher (Cardiff University, 2003-2010), Cardiff Academic Fellow (Arthritis Research UK, 2010-2014), since 2014 Lecturer (Cardiff University School of Dentistry)

The focus of my research is to identify the early cellular events that occur in disease processes such as arthritis. These early events can then be exploited as indicators of disease to enable early diagnosis and treatment, or as a means of manipulation and modification of the disease process. Areas of expertise include Ca^{2+} imaging, confocal and single cell microscopy.

Key Publication:

Al-Jumaa M, et al. (2020). Cell surface topography controls phagocytosis and cell spreading: the membrane reservoir in neutrophils. *BBA-Mol Cell Res* 12: 118832.

Full list at: www.cardiff.ac.uk/people/view/39492-dewitt-sharon



Dr Vera Knäuper

✉ KnauperV@cardiff.ac.uk
☎ +44 (0)29 2074 2595

Diploma in Chemistry (equivalent BSc, University of Bielefeld, Germany), Dr rer. nat. (equivalent PhD in Biochemistry, University of Bielefeld, Germany), 1993-1995 Wellcome Trust Travelling fellow (Strangeways Research, Cambridge), 1995-2000 Post-doctoral fellow (University of East Anglia, Norwich), 2001-2006 Lecturer (University of York, York), since 2006 Senior Lecturer (Cardiff University)

My major research interests are understanding metalloproteinase function in the arthritic diseases and cancer. My main focus is to understand the role of metalloproteinases in cellular signalling, including novel work on regulation of MET signalling.

Key Publication:

Howes J-M, et al. (2020). Cleavage by MMP-13 renders VWF unable to bind to collagen but increases its platelet-reactivity. *Journal of Thromb Haemost* 18(4): 942-954.

Full list at: www.cardiff.ac.uk/people/view/39462-knauper-vera

Advanced Therapies Group

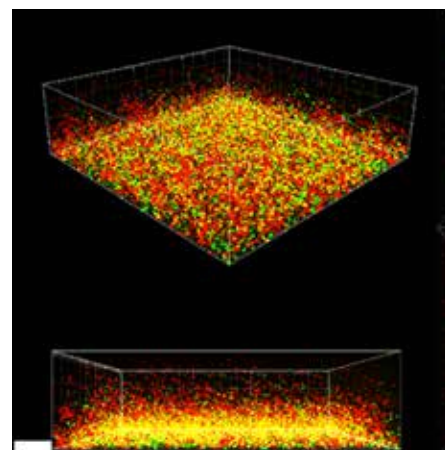
We are a multi-disciplinary team of clinicians, microbiologists, pharmacists, cell biologists and engineers whose research aims to apply our knowledge of the molecular and cellular control of human disease processes, to inform the design, development and testing of novel therapies.

www.cardiff.ac.uk/research/explore/research-units/advanced-therapies-group

Working with our academic, industrial and clinical partners around the world, we are using our expertise in the design and delivery of novel therapeutic interventions to target a range of, often life-threatening, infective and chronic inflammatory conditions including multi-drug resistance, cystic fibrosis, chronic skin wounds and also peri-implantitis.

Our goals are:

- To translate our findings, from the laboratory to the clinic, to improve treatments for patients.
- To develop treatment strategies (both topical and intravenous) to improve current treatment efficacy/efficiency and inform the design of novel polymer therapeutics.
- To utilise the toolkit our experienced inter-disciplinary team has developed, to analyse anti-biofilm therapeutic interventions against bacterial biofilms and surfaces (at the cellular, protein and gene levels).



Confocal laser scanning microscopy of *E. coli* biofilms treated with epoxy-tiglyanes using LIVE/DEAD viability staining. (Scale bar = 20 µm).

Highlights of 2021:

- BBSRC UK award of £606,000 with the School of Medicine entitled 'Mapping the lipid envelope composition of SARS-CoV-2 to modify inflammation, thrombosis and infection'.
- Completion of the MOMA interventional mouthwash study across Wales in patients with COVID-19.
- Commencement of the School's first China Scholarship Council PhD studentship (to Jingxiang Wu), in a project with Oxford University and QBiotech.
- Appointment of Dr Juliette Oakley (MD student) as Consultant in Respiratory Medicine at Bristol Children's Hospital and Dr Catrin Williams (RA) as Lecturer in Microbiology in BIOSCI, Cardiff University.
- Promotion of Dr Elaine Ferguson to Director of Research for the School of Dentistry.

Our plans for 2022:

- Continuing the epoxy-tiglyane work in relation to: colistin resistance, biofilm modelling and biofilm EPS characterisation.
- Supporting the translation of EBC-1013 into human studies.
- Expanding our polymer therapeutics research to explore innovative bioresponsive polymers and new therapeutic targets.

Key project summary:

Quantifying the effects of antibiotic treatment on the extracellular polymer network of antimicrobial resistant and sensitive biofilms using multiple particle tracking

Background: Novel therapeutics designed to target the polymeric matrix of biofilms, require innovative techniques to accurately assess their efficacy. Here, we used multiple particle tracking (MPT) microrheology to characterize the physical and mechanical properties of antimicrobial resistant (AMR) bacterial biofilms and for the first time, to quantify the effects of antibiotic treatment.

Discovery: Studies employed nanoparticles (NPs) of varying charge and size (40–500 nm) in *Pseudomonas aeruginosa* PAO1 and methicillin-resistant *Staphylococcus aureus* (MRSA) biofilms and also in polymyxin B (PMB) treated *Escherichia coli* biofilms of PMB-sensitive (PMB^{Sens}) IR57 and PMB-

resistant (PMB^R) PN47 strains. NP size-dependent and strain-related differences in the diffusion coefficient values of biofilms were evident between PAO1 and MRSA (Table 1). Dose-dependent treatment effects induced by PMB in PMB^{Sens} *E. coli* biofilms included increases in diffusion (Fig. 1) and creep compliance (Fig. 2; $P < 0.05$), not evident in PMB treatment of PMB^R *E. coli* biofilms (Fig. 3).

Importance: The ability of MPT to quantify the diffusion and mechanical effects of antibiotic therapies within the biofilm matrix of antibiotic-resistant and -sensitive bacteria, highlights its potential usefulness for pre-clinical screening of anti-biofilm therapies.

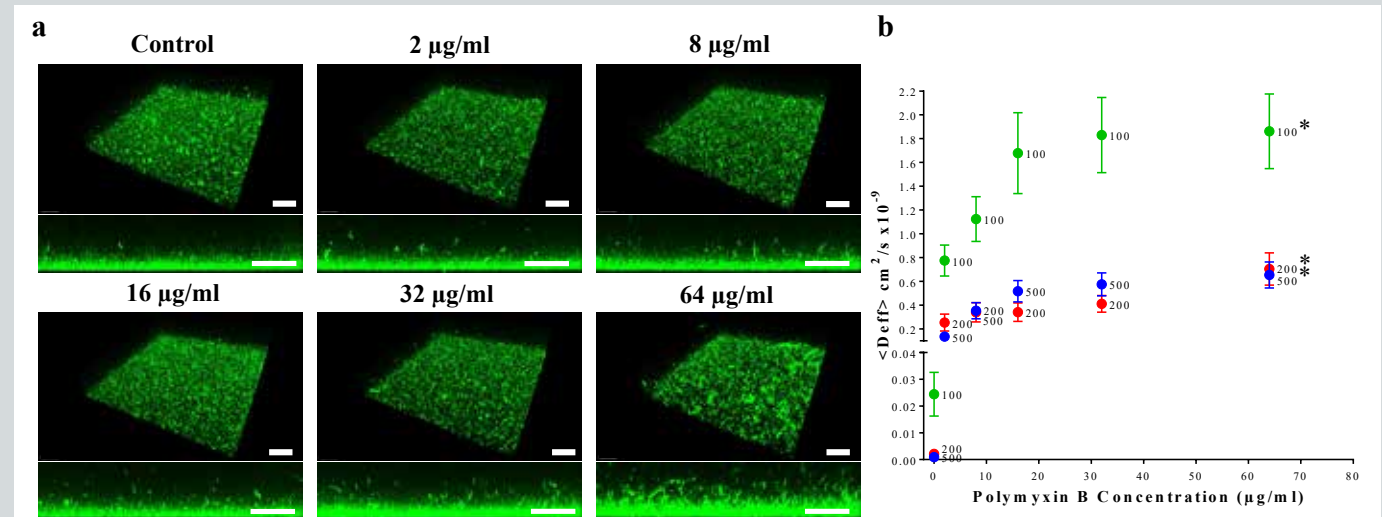


FIG 1 Nanoparticle diffusion within and disruption of *E. coli* IR57 (PMB^{Sens}) biofilms treated with polymyxin B. Polymyxin B (PMB)-treated (2, 8, 16, 32, 64 µg/ml) and untreated PMB^{Sens} *E. coli* IR57 biofilms showing: (a) CLSM 3D and side-on imaging of biofilms grown for 48 h at 37°C in MH broth followed by polymyxin B treatment for a further 24 h in MH broth, visualized using Syto9[®] staining (Scale bar, 40 µm; n=3). (b) Diffusion coefficient $\langle D_{eff} \rangle$ of 100, 200 and 500 nm negatively-charged carboxylate modified FluoSphere[®] particles in non-treated versus polymyxin B treated biofilms (n=3, SEM). *indicates FluoSphere[®] particle sizes of 100, 200 and 500 nm.

Fig 2

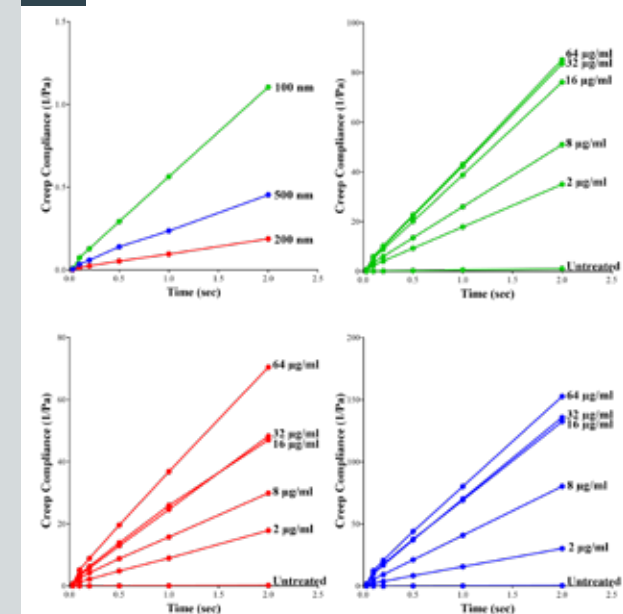


Fig 3

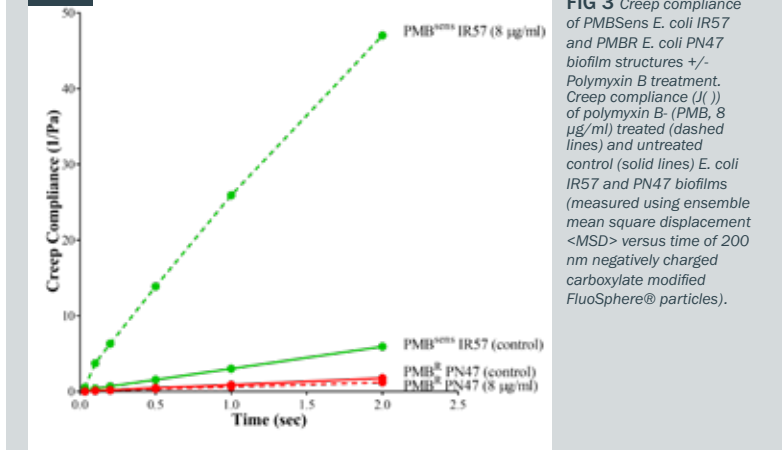


FIG 2 Creep Compliance of *E. coli* IR57 (PMB^{Sens}) biofilms treated with Polymyxin B. Creep compliance ($1/Pa$) of *E. coli* biofilms (measured using the ensemble mean square displacement $\langle MSD \rangle$ versus lag time of 100, 200 and 500 nm negatively-charged carboxylate modified FluoSphere[®] particles) representing biofilm deformation in response to polymyxin B treatment (2, 8, 16, 32 and 64 µg/ml) versus untreated biofilm. (a) Untreated *E. coli* biofilms for 100, 200 and 500 nm FluoSphere[®] particles and (b) 100 nm FluoSphere[®] particles, (c) 200 nm FluoSphere[®] particles (d) 500 nm FluoSphere[®] particles, in response to polymyxin B treatment.

Text and images adapted from: Powell, L. C. et al. 2021. Quantifying the effects of antibiotic treatment on the extracellular polymer network of antimicrobial resistant and sensitive biofilms using multiple particle tracking. *npj Biofilms and Microbiomes* 7(1), p.13. <https://doi.org/10.1038/s41522-020-00172-6>.

(Reproduced with permission <http://creativecommons.org/licenses/by/4.0/>).



Dr Elaine L Ferguson

✉ FergusonEL@cardiff.ac.uk
☎ +44 (0)29 2251 0663

With a background in Pharmacy, my translational research in polymer therapeutics focuses on optimising drug release by attachment of biodegradable polymers to target proteins, peptides and drugs to sites of inflammation, thereby minimising toxicity, overcoming resistance and increasing bioavailability. Ongoing research, in collaboration with pharmaceutical and nutraceutical companies, is investigating novel combinations of polymers and biomolecules/ drugs, and investigating novel temporal triggers for drug release from polymer therapeutics. I was appointed as Director of Research for the School of Dentistry in September 2021.

Key Publication:

Chiron E, et al. (2021). A physicochemical assessment of the thermal stability of dextrin–colistin conjugates. *Science Reports* 11: 10600.

Full list at: www.cardiff.ac.uk/people/view/39401-ferguson-elaine



Dr Katja E Hill

✉ HillKE1@cardiff.ac.uk
☎ +44 (0)29 2251 0661

With a background in microbial ecology and molecular biology, I am interested in the mechanisms of gene regulation and control in bacterial biofilms. My current research involves translation to clinical practice through the testing of novel compounds (from e.g. seaweed and the Australian rainforest) for the management of human chronic diseases such as cystic fibrosis and wound healing of 'difficult to treat' wounds, to characterise their antibacterial/anti-biofilm properties.

Key Publication:

Powell LC, et al. (2021). Quantifying the effects of antibiotic treatment on the extracellular polymer network of antimicrobial resistant and sensitive biofilms using multiple particle tracking. *NPJ Biofilms and Microbiomes* 7:13.

Full list at: www.cardiff.ac.uk/people/view/39529-hill-katja



Dr Manon F Pritchard

✉ PritchardMF@cardiff.ac.uk
☎ +44 (0)29 2251 0659

Following completion of my dental degree, clinical foundation years and PhD in microbiology, I have successfully published a series of papers and been awarded several prizes in recognition of my work. I am currently developing therapeutic nanomedicines for the treatment of multi-drug resistant bacterial biofilm infections. My research is consolidated by my successfully obtaining a Precision Medicine Fellowship from the Welsh European Funding Office (WEFO).

Key Publication:

Oakley JL, et al. (2021). Phenotypic and genotypic adaptations in *Pseudomonas aeruginosa* biofilms following long-term exposure to an alginate oligomer therapy. *mSphere* 6:e01216-20. [https://doi.org/10.1128/](https://doi.org/10.1128/https://doi.org/10.1128/) Full list at: www.cardiff.ac.uk/people/view/178890-pritchard-manon



Professor David W Thomas

✉ ThomasDW2@cardiff.ac.uk
☎ +44 (0)29 2251 0664

A clinician with a background in studying the role of microbial biofilms in human disease states to improve their management and diagnosis, I lead the Advanced Therapies Group. I am a previous Wellcome Trust Clinical fellow (Bristol University) and currently Professor/ Hon. Consultant in Oral and Maxillofacial Surgery at the University Hospital of Wales.

Key Publication:

Powell LC et al. (2021). Quantifying the effects of antibiotic treatment on the extracellular polymer network of antimicrobial resistant and sensitive biofilms using multiple particle tracking. *npj Biofilms and Microbiomes* 7: 13. Full list at: www.cardiff.ac.uk/people/view/39420-thomas-dave-w

Microbial Diseases

The interests of the Microbial Diseases Research Group encompass a breadth of oral and non-oral human infections. An important research focus is investigating the involvement of microbial biofilms in human infection, the way the host responds to biofilms and the development of novel approaches to manage these recalcitrant microbial growth forms. We are a multidisciplinary research group and work closely with clinicians, chemists, pharmacists and engineers. Our research is supported through our dedicated facilities and equipment for biofilm study. As we are based in a clinical school and operate in close alignment with the oral and medical microbiology laboratories, we benefit not only from access to clinical specimens but also in rapidly identifying research areas where there is clinical concern.

www.cardiff.ac.uk/research/explore/research-units/microbial-diseases-research-group

Our research aims are:

- To develop novel approaches in the management of biofilm-mediated human infections
- To characterise biofilm communities, the relationships between associated microorganisms and the way the local environment influences biofilm behaviour
- To explore how the host responds to infection, with the aim of developing diagnostics and immunotherapies

Previously, the study of microorganisms in human infection primarily focused on monotypic species grown in broth culture. Furthermore, the assessment of antimicrobial susceptibility is also predominantly based on testing microorganisms in liquid culture. What is now increasingly evident is that infections most frequently involve microorganisms attached to a surface and encased within protective extracellular matrices. These growth forms are referred to as biofilms and are responsible for an estimated 65% of human infections. Dental plaque is the most widely studied biofilm and is the cause of both caries and periodontal disease which are amongst the most prevalent of human infections. Biofilms are highly resilient and can exhibit a 1000-fold greater tolerance to administered antimicrobials compared to the same microorganisms grown in broth culture. Exploring strategies to eradicate biofilms where they are causing infection therefore represents an extremely challenging and important area of study.

Highlights of 2021:

- Mrs Rania Nassar received the 2021 IADR Colgate Research in Prevention Travel Award in recognition of her research entitled: "Antimicrobial Activity of Phytic Acid: A Potential Endodontic Irrigant."
- Dr Katrina Duggan was successful in passing her PhD viva with her thesis entitled: "Biomaterial modulation for diagnostic and therapeutic benefit in catheter-associated urinary tract infection."
- Mr Abdullah Albarrak joined the group on a studentship to explore "Strategies to analyse and control the extracellular polymeric substances of biofilm."
- Ms Megan Williams was a recipient of a UK-Canada Global link award to undertake research with Dr Laurent Bozec at the University of Toronto. Her project will investigate nanoscale interactions of *Candida* species with oral bacteria and surfaces.
- Completion of second cycle of National Audit of Antimicrobial Prescribing in UK and Ireland Dental Hospitals.

Our plans for 2022

- The microbial diseases research group will continue to investigate clinically relevant biofilms with a focus into the characterisation of the composition of in vitro and in vivo characterisation of the microbiome and the quantity and type of extracellular matrix components in biofilms.
- Using nanoscale surface imaging interrogation of substrate and microbial surfaces we will expand our knowledge of the interactions of biofilm cells with their environment and how this influences biofilm pathogenicity.
- To promote these activities the group will further develop its collaborative links both nationally and internationally with research partners in the area of 'biofilmology'.

Key project summary:

Antimicrobial efficacy of the potential endodontic irrigant, Phytic acid.

Nassar R et al, 2021. *Front Cell Infect Microbiol* 11:75364

Background: Bacteria and their associated biofilms are significant causes of failure of root canal treated teeth. Consequently, the elimination of contaminating bacteria is a key objective during root canal treatment. Treatment of root canal infections involve physical debridement coupled with use of irrigation solutions with antimicrobial activity to remove biofilms. The synthetic chelant ethylenediaminetetraacetic acid (EDTA), is one of the most frequently used agents for smear layer removal during root canal treatment. However, EDTA has several disadvantages including host cell toxicity against periradicular tissue and an inability to effectively eradicate biofilms. As a result, there is need to identify alternative agents.

Recently, a naturally occurring compound called phytic acid (IP6) has been reported to effectively remove the smear layer, without associated host cell toxicity. Importantly, preliminary studies have indicated antimicrobial activity of IP6 against planktonic cultures of the endodontic pathogen *Enterococcus faecalis*. However, the spectrum of this activity and effectiveness against biofilms has yet to be determined. The aim of this research was to further evaluate IP6 against a range of microbial species and associated biofilms and compare the findings with those of EDTA.

Discovery: Antibacterial and antibiofilm activity of IP6 against 12 microbial strains was assessed by determining the minimum inhibitory concentration (MIC), minimum bactericidal activity (MBC) and minimum biofilm eradication concentration (MBEC). Comparative tests were also undertaken using EDTA and sodium hypochlorite (NaOCl). IP6 had antimicrobial activity against all planktonic test cultures at 0.156% (w/w). *In vitro* biofilms in microtiter wells were also found to be eradicated by IP6 and at greater extent than those treated using either NaOCl or EDTA. Progression of this research to biofilms generated on hydroxyapatite coupons in a bioreactor confirmed the effective antibiofilm properties of IP6. In these studies, 5 min exposure of 72-h old biofilms revealed a substantial kill of *Enterococcus faecalis* compared with untreated biofilms (Figure 1).

Importance: The significance of this work lies in the identification of the antibiofilm activity of IP6 which is a potentially safer endodontic agent than NaOCl. Clinical application of IP6 could in the future help both in reducing occurrence of root canal treatment complications and negative effects on healthy vital tissue.

Acknowledgements:

This research is a collaborative study involving the School of Dentistry, Cardiff University and researchers at Mohammed Bin Rashid University of Medicine and Health Sciences, Dubai. The work forms part of a PhD studentship being conducted by Mrs Rania Nassar under the supervision of Professor David Williams, Dr Melanie Wilson and Prof Abiola Senok.

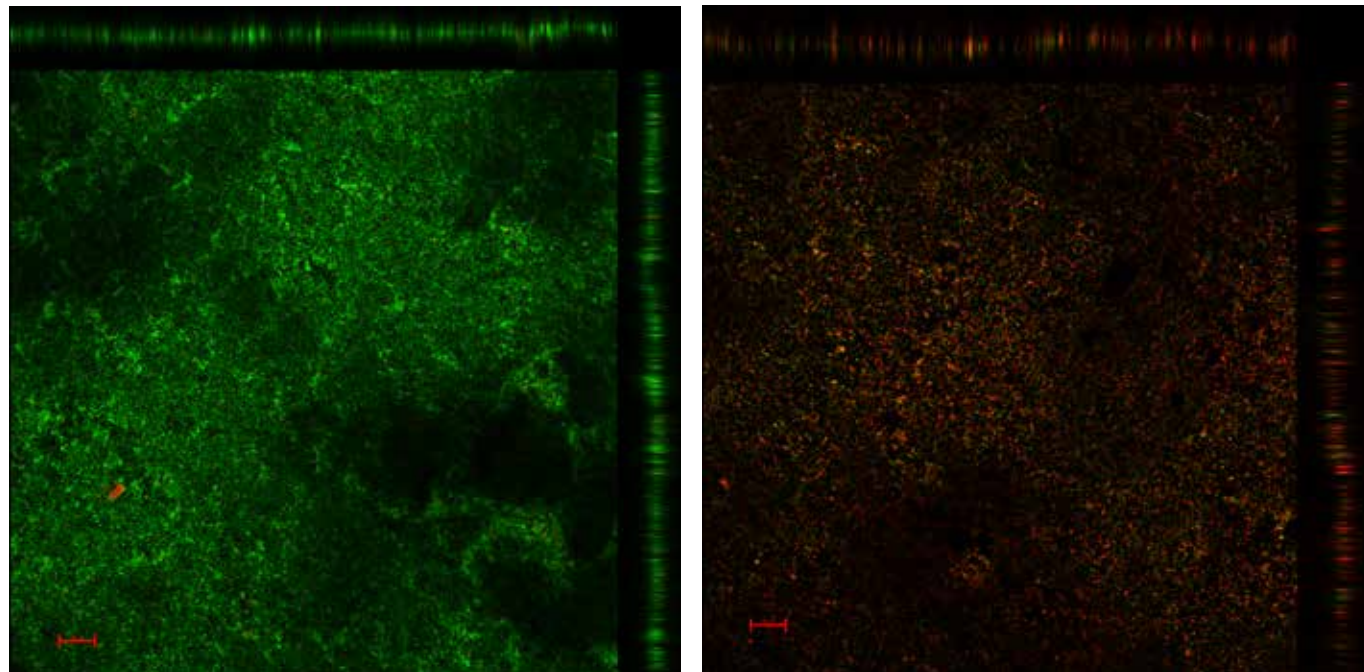


Figure 1. *Enterococcus faecalis* biofilms (72 h) on hydroxyapatite coupons stained with a live/dead stain and imaged by confocal laser scanning microscopy. Green cells are viable and red cells are dead. A) untreated biofilm, B) Biofilm treated with 5% (w/w) phytic acid for 5 min.



Professor Mike Lewis

✉ LewisMAO@cardiff.ac.uk

Prior to retiring in August 2021, Professor Lewis (ML) was Professor of Oral Medicine in the School of Dentistry. He served as Dean of the School of Dentistry (2010-2017) and Director of the Clinical Board for Dentistry of Cardiff & Vale University Health Board (2010-2018). He held an honorary NHS position as Consultant in Oral Medicine.

His research interests for more than 30 years have involved clinical and laboratory-based aspects of orofacial bacterial, candidal and viral infections. On-going research projects include the involvement of biofilms in ventilator-associated pneumonia and denture stomatitis (erythematous candidosis). He also has active studies exploring the appropriate usage of antimicrobial agents in primary dental care practices within Wales and antibiotic prescribing for treatment or prophylaxis of dental infections in secondary care dental hospitals in the UK. He is presently developing a Quality Improvement Tool for management of Mouth Cancer in primary care in Wales.

Key Publication:

Mark Erwin P, et al. (2021). Droplet sizes emitted from demonstration electric toothbrushes. *International Journal of Environmental Research and Public Health* 18(5): 2320.

Full list at: www.cardiff.ac.uk/people/view/39465-lewis-michael



Professor Mark Waters

✉ WatersMG@cardiff.ac.uk

Mark Waters is Professor of Biomaterials and a Director of MBI (Wales) Ltd, an R&D lead University spin-out company specializing in the formulation of custom silicone elastomers.

He has over 25 years' experience in the area of biomaterials and in particular in the development of novel silicone elastomeric materials. Recent research has focussed on the development of antimicrobial silicone materials and biosensors for detecting the early onset of bacterial infection. This work has led to a patented sensor which gives an early warning of impending urinary catheter blockage caused by the prevalence of urease producing bacteria in the bladder.

Key Publication:

Jindal S et al, (2018). Development of a 3D printable maxillofacial silicone. Part II: Optimization of moderator and thixotropic agent. *J Prosthet Dent* 119(2): 299-304.

Full list at: www.cardiff.ac.uk/people/view/183030-mark-waters



Dr Xiao-Qing Wei

✉ WeiX1@cardiff.ac.uk

☎ +44 (0)29 2251 0648

Dr Xiao-Qing Wei is a Senior Lecturer who has a Medical degree and a PhD in Immunology. Cytokines play a pivotal role in controlling the outcome of infectious and inflammatory diseases by regulation of host innate and adaptive immunity. His research has focused on understanding the role of some important pro-inflammatory cytokines, such as IL-18, IL-12, IL-23, IL-27 and a novel anti-inflammatory cytokine, IL-35, in the disease process in order to find practical ways to regulate host immune responses for disease treatment.

Key Publication:

Chen S, et al. (2021). Circ-NOLC1 promotes epithelial ovarian cancer tumorigenesis and progression by binding ESRP1 and modulating CDK1 and RhoA expression. *Cell Death Discovery* 7: 22.

Full list at: www.cardiff.ac.uk/people/view/39509-wei-xiao-qing



Professor David W Williams

✉ WilliamsDD@cardiff.ac.uk

☎ +44 (0)29 2251 0654

Professor Williams (DW) Leads the Oral and Biomedical Sciences research theme and is a principle investigator within the Microbial Diseases research group.

His research interests primarily focus on microbial biofilms and their involvement in human infection. Over 65% of hospital infections have a biofilm origin and their treatment is highly problematic given their high resistance to antimicrobials. Unsurprisingly, biofilm research is extremely important and timely given global concerns over the emergence of antimicrobial resistance. On-going projects that study biofilms are investigating catheter associated urinary tract infections, denture stomatitis, endodontic infections and the extracellular matrix of biofilms. Prof Williams has access to a dedicated biofilm research laboratory which houses a range of flow cells and bioreactors to enable his research.

Key Publication:

Vanhatalo A et al, (2021). Network analysis of nitrate-sensitive oral microbiome reveals interactions with cognitive function and cardiovascular health across dietary interventions. *Redox Biol* 41: 101933

Full list at: www.cardiff.ac.uk/people/view/39506-williams-david



Dr Melanie Wilson

✉ WilsonMJ@cardiff.ac.uk

☎ +44 (0)29 2251 0655

Dr Wilson is a Senior Lecturer and Honorary Consultant in Oral Microbiology.

The main focus of her research has been the application of molecular methods to the study of complex microbial communities, including dental plaque, the chronic wound microbiota, bacteria associated with oral cancer and, more recently, the biofilms involved in community and ventilator associated pneumonia. Other research interests relate to antimicrobial resistance in orofacial infection, the antimicrobial and antibiofilm effects of probiotics and their products, and host pathogen interactions, for example the interaction of microaerophilic streptococci with extracellular matrix components and *Candida* species with host tissues.

Key Publication:

Morse D et al, (2019). Modulation of *Candida albicans* virulence in vitro biofilms by oral bacteria. *Lett Appl Microbiol* 68(4): 337-343.

Full list at: www.cardiff.ac.uk/people/view/39519-wilson-melanie

Regenerative Biology Group

Our research aims to enhance understanding of the cellular and molecular mechanisms regulating the repair and regeneration of oral, dental, dermal and neural tissues, during health and disease. With research interests across cell, biology, matrix biology, drug delivery, biomaterial sciences and clinical dentistry, our goal is to develop stem cell, pharmaceutical, biomaterial, bioelectrical and other therapeutic strategies to promote repair in these and other tissues throughout the body.

www.cardiff.ac.uk/research/explore/research-units/regenerative-biology-group

Our goals

- To understand the mechanisms underlying the repair and regeneration of oral, dermal and neural tissues, during health and disease.
- To develop novel targeted technologies to promote tissue repair and regeneration in oral and non-oral tissues.

Despite significant medical advances in recent years, clinical conditions associated with impaired or dysfunctional healing remain a major healthcare challenge; especially with the rising incidence of these conditions due to ageing populations, diabetes, antimicrobial resistance and the acknowledged inadequacies in current treatment options.

Research within the Regenerative Biology Group is particularly focussed on the role of tissue-intrinsic mesenchymal stromal cells (isolated from dental pulp, bone marrow, oral mucosa) in driving tissue repair processes.

We aim to have a positive impact on patient health and well-being, by continuing our research advances in developing “stem” cell technologies with pharmaceutical, biomaterial, bioelectrical and other therapeutic approaches for the treatment of diseases and conditions affecting dental, maxillofacial and orthopaedic functioning; impaired dermal wound healing and organ fibrosis; and spinal cord repair. A further focus of our research is the development of novel antimicrobial delivery and release technology for the elimination of bacterial infections that can hamper repair processes.

Through academic, clinical and industrial collaborations, we aim to facilitate the advancement of novel and more effective repair and regenerative therapies to drive improvements in patient quality of life.

Highlights of 2021

- Dr Wayne Nishio Ayre, in collaboration with Prof Phil Davies (Chemistry), Dr Bo Hou (Physics), Dr Kelly BeruBe (Biosciences) and Dr Tim Jones (Earth and Environmental Sciences), was awarded a £1M EPSRC Strategic Equipment grant to commission the UK's first photo-induced force microscopy (PiFM) system at Cardiff University.
- Prof Phil Stephens received funding to commission an external Regulatory Strategy & Gap Analysis as part of the group's on-going translational development of oral progenitor cells as stimulators of soft tissue repair.
- Dr Ryan Moseley was awarded a 3-year Dunhill Medical Trust Research Project grant (£298,338) to develop small molecule therapeutics for the treatment of non-healing, chronic skin wounds and a 2-year QBiotics Group funded grant (£272,205), to elucidate how small molecule therapeutics modulate wound healing responses in dermal fibroblasts.
- Dr Ryan Moseley was appointed as Chair of the Regenerative Dentistry Research group, and the British Society British Society for Oral and Dental Research (BSODR) and elected as a Board Member of the European Tissue Repair Society (ETRS).
- Prof Rachel Waddington was elected President of the BSODR, the first female president in the Society's 53-year history.

Our plans for 2022

The Regenerative Biology Group (RBG) will focus on three key research areas in 2022: namely the utilisation of (i) extracellular vesicles, (ii) small molecules and (iii) cell-based therapies for tissue repair and regenerative approaches.

We will continue to characterise and investigate the therapeutic potential of extracellular vesicles as anti-scarring and antimicrobial agents for soft tissue wound repair and as pro-osteogenic mediators for accelerating mineralised tissue repair.

Our group will build on our track record of small molecule development and light-based therapies in the repair of dermal and gingival soft tissues respectively.

We will apply our expertise in tissue engineering and translational medicine to progress cell-based approaches to regenerate nerve tissues.

Key project summary:

Silane-treated anatase titanium dioxide, a promising radiopacifier for preventing bone cement failure.

Nishio Ayre W et al, 2021. J Biomat App. 35(10):1235-1252.

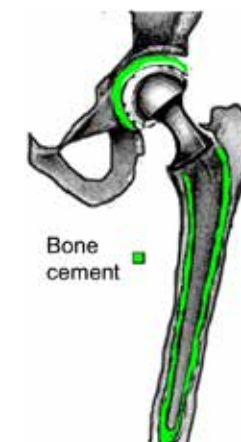


Fig.1: Cemented hip replacement.

Background: Total joint replacements are one of the most successful surgeries of the 20th Century, reducing pain and restoring function to diseased hips and knees. According to the National Joint Registry, approximately 200,000 hip and knee replacements were performed in the UK in 2019 with 14,498 revisions performed due to implant failure, predominantly caused by aseptic loosening (33-40% of all revisions). A material widely employed in these procedures is polymethyl methacrylate bone cement, which acts as a grouting material, securing the metal implant to bone (Fig 1). Cracking of bone cement can lead to loosening of the implant and early failure and is associated with stress concentrations, which arise from defects, such as voids and radiopacifier agglomerates. This research investigated whether alternative radiopacifiers could be used to prevent crack formation in bone cement and whether chemical functionalisation of the radiopacifier could further enhance the biological and fatigue performance of orthopaedic bone cement.

Discovery: The use of anatase titanium dioxide or yttria-stabilised zirconium dioxide as alternative radiopacifiers over conventional barium sulphate did not enhance the compressive and bending strength of bone cement (Fig 2). The addition of anatase titanium dioxide at high concentrations significantly reduced the bending strength and fracture toughness of the cement whilst increasing the overall stiffness of the material. Similarly, crack resistance was reduced due to the formation of voids around agglomerates of these alternative radiopacifiers (Fig 3). By functionalising the surface of these radiopacifiers with a silane coupling agent (methacryloxypropyltrimethoxysilane) however, better adherence to the cement matrix was achieved, resulting in significant enhancements in mechanical and fatigue properties. Interestingly, the addition of anatase titanium dioxide to bone cement also encouraged hydroxyapatite nucleation in simulated body fluid and significantly increased the attachment of MC3T3-E1 preosteoblast cells.

Importance: These findings offer a potential solution to improve the mechanical and crack resistant properties of orthopaedic bone cement, whilst simultaneously encouraging more rapid hydroxyapatite formation and cell attachment. This technology has the potential to ultimately reduce cracking, aseptic loosening and failures rates in cemented joint replacements.

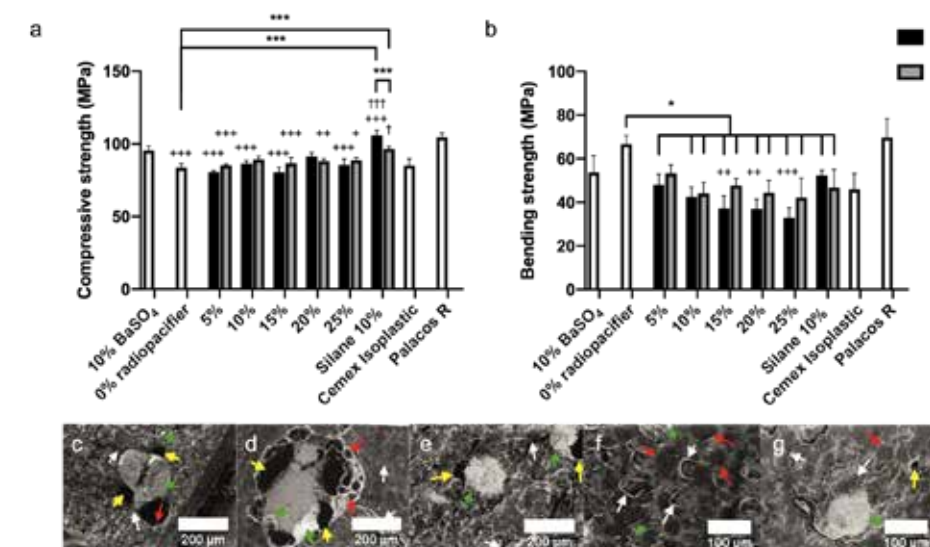


Fig. 2: (a) Compressive and (b) bending strength, of bone cements containing alternative radiopacifiers. Scanning electron microscopy images of radiopacifier agglomerates on the fracture surface of (c) BaSO₄, (d) TiO₂, (e) ZrO₂, (f) silane treated TiO₂ and (g) silane treated ZrO₂ cement samples

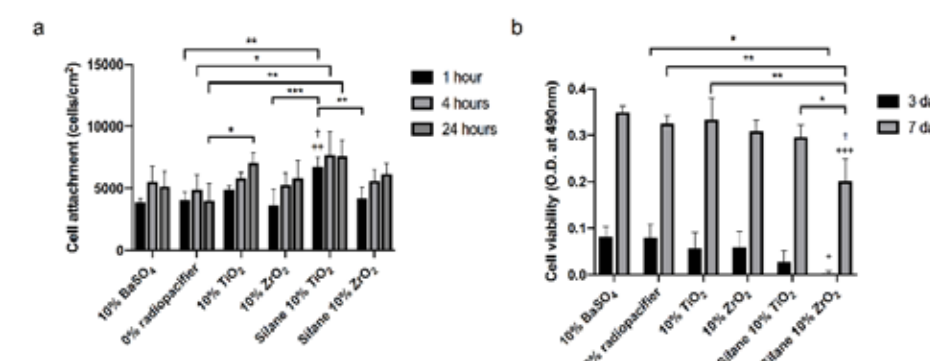


Fig. 3: MC3T3-E1 (a) cell attachment and (b) viability on cement samples containing different radiopacifiers.



Dr Ryan Moseley

✉ MoseleyR@cardiff.ac.uk

☎ +44 (0)29 2251 0649

BSc (Hons) Biochemistry, Swansea University, 1991; PhD Oral Biochemistry, University of Wales College of Medicine, 1996. Since 2017, Reader in Tissue Repair, Cardiff University.

Research interests: Mechanisms underlying preferential (e.g. oral mucosa), normal (e.g. skin, bone) and impaired/ abnormal tissue repair (e.g. chronic wound, diabetic bone) responses and fibrosis (keloid scars); development of cellular, biomaterial and pharmaceutical strategies for enhanced oral-dermal wound healing and reduced scarring; characterization and development of dental pulp stem cells (DPSCs) for clinical applications.

Key Publication:

Alaidaroos NYA et al, (2021). Differential SOD2 and GSTZ1 profiles contribute to contrasting dental pulp stem cell susceptibilities to oxidative damage and premature senescence. Stem Cell Research & Therapy 12:142.

Full list at: www.cardiff.ac.uk/people/view/39455-moseley-ryan



Professor Bing Song

✉ SongB3@cardiff.ac.uk

☎ +44 (0)29 225 10667

MD, China Medical University, China (1995). PhD, School of Medical Sciences, University of Aberdeen, UK (2004). University Research Fellow, the Royal Society, UK (2005). Since 2009, Professor of Regenerative Medicine, Cardiff University. British Council Global Innovation Initiative award (2014). Since 2017, Director of International, School of Dentistry, Cardiff University.

Research interests: Electric signal regulated stem cell biology; electric signal promoted neural regeneration and repair; remyelination of regenerated neuron with oligodendrocyte progenitor cells; dental pulp stem cells based bioengineered nanoscaffold assisted tissue engineering; stem cell encapsulation; cornea and retina regeneration; electric signal regulated immunisation and wound repair.

Key Publication:

Song B et al, (2021). Electric signals counterbalanced posterior vs anterior PTEN signaling in directed migration of Dictyostelium. Cells and Bioscience 11: 111.

Full list at: www.cardiff.ac.uk/people/view/39415-song-bing



Dr Petros Mylonas

✉ mylonasp@cardiff.ac.uk

☎ +44 (0)29 2184 2455

BDS, University of Birmingham (2012); MMedEd, Warwick University (2018); PhD in Prosthodontics and Biomaterials, King's College London (2019). Member of the Joint Dental Faculties of the Royal College of Surgeons of England (MJDF RCS, 2013); member of the Faculty of Dental Surgery of the Royal College of Physicians and Surgeons of Glasgow

(MFDS RCS, 2016), Fellow of the Higher Education Authority (FHEA, 2016). Surface Topography: Metrology and Properties Emerging Leaders award for research excellence in Surface Metrology (2021); BES Full-time Inspirational Lecturer award for teaching excellence (2021). Currently Clinical Lecturer and Speciality Training Registrar in Restorative Dentistry.

His research interests are in the fields of Surface Metrology, Prosthodontics, Dental Materials, Erosive Toothwear, Cariology, and Dental Education. He has extensive experience in hard tissue in vitro laboratory research methodology, particularly in the use of polished and unpolished human enamel substrates, the development of novel oral care testing techniques, and in the use of non-destructive characterisation techniques such as non-contacting laser profilometry, optical coherence tomography, and 3D x-ray computed tomography. He has established links with industry partners and other metrology and dental education groups within the UK.

Key Publication:

Mylonas P et al, (2021). Surface form analysis on complex freeform organic structures – measuring erosive wear on human teeth in vitro. Surface Topography: Metrology and Properties 9(2): 025024

Full list at: www.cardiff.ac.uk/people/view/2398615-mylonas-petros



Professor Phil Stephens

✉ StephensP@cardiff.ac.uk

BSc (Hons) Biochemistry and Cell Biology, University of Leeds; PhD Biochemistry and Cell Biology, University of Leeds. Since 2008, Professor of Cell Biology, Cardiff University. Since 2013, Designated Individual HTA Research Licence, Cardiff University. Since 2015, Academic Lead for Cardiff University Biobank. Since 2016, Dean of International & Engagement, College of Biomedical and Life Sciences, Cardiff University. From 2017 to 2019, President of the European Tissue Repair Society (ETRS).

Research interests: Oral progenitor cell biology (lineage development/control, immunosuppression, bacterial suppression, tissue healing); dysfunctional (chronic skin wound) biology; development of in vitro systems to replace animals in experimentation; live cell imaging (in vitro and in vivo).

Key Publication:

Brown H et al, (2021). The role of bacterial extracellular vesicles in chronic wound infections: current knowledge and future challenges. Wound Repair and Regeneration 29(6): 864-880

Full list at: www.cardiff.ac.uk/people/view/39411-stephens-phil



Dr Wayne Nishio Ayre

✉ AyreWN@cardiff.ac.uk

☎ +44(0)2922510660

PhD, Mechanical Engineering, Cardiff University Biomechanics and Bioengineering Centre Versus Arthritis (2013); BEng Medical Engineering, Cardiff University (2009). Welsh Crucible - Future Research Leaders of Wales Programme (2017); British Orthopaedic Research Society – International Travelling Fellowship (2016); Cardiff Institute of Tissue

Engineering and Repair Young Investigator Award (2015); IADR-PER GSK-Mineralised tissue group prize (2014); The Worshipful Company of Engineers Mercia Award in Medical Engineering (2014). Currently Lecturer in Biomaterials, School of Dentistry.

Dr Ayre's research interests are focused on the design, development and testing of medical devices and biomaterials. His particular areas of interest revolve around using lipid coatings and delivery systems to enhance osseointegration and prevent infections of orthopaedic implants and dental materials. other metrology and dental education groups within the UK.

Key Publication:

Jiao Y et al, (2021). In vitro cytocompatibility of a Zr-based metallic glass modified by laser surface texturing for potential implant applications. Applied Surface Science 547: 149194

Full list at: www.cardiff.ac.uk/people/view/142785-nishio-ayre-wayne



Professor Rachel Waddington

✉ waddingtonrj@cardiff.ac.uk

☎ +44(0) 29 225 10647

PhD, Faculty of Medicine, University of Liverpool (1988); BSc (Hons), Biochemistry, University of Birmingham (1984). Winner of Senior Colgate prize (1990) and the MINTIG Mineralised tissue Research travel prize (1996), awarded by the British Society for Dental and Oral Research. Currently professor in Oral Biochemistry and Associate Director for Engagement, Enterprise and Innovation; co-lead of the Mineralised Tissue Research Group.

Research interests: understanding the role of the extracellular environment, matrix components and extracellular vesicles, in the regulation the biology and differentiation of mesenchymal stem cells during bone, dentine and periodontal tissue repair; changes to the extracellular matrix during type 2 diabetes influencing bone repair; modification of implant surfaces on osteogenic processes to enhance osseointegration.

Key Publication:

Luo L, et al, (2021). Exploring a chemotactic role for EVs from progenitor cell populations of human exfoliated deciduous teeth for promoting migration of naïve BMSCs in bone repair process. Stem Cells International 2021: 6681771

Full list at: www.cardiff.ac.uk/people/view/39516-waddington-rachel

Dental Public Health

Our research focuses on oral health improvement. Our portfolio of research ranges from clinical trials of preventive dental technologies to studies designed to further understand, and address, oral health inequalities and projects to improve the delivery of dental care.

www.cardiff.ac.uk/research/explore/research-units/dental-public-health-unit



Our goals are:

To undertake research from a population perspective which will:

- Inform dental health and care need in Wales and beyond
- Contribute to the evidence base for effective preventive dental care
- Change how dental care is delivered to maximise benefit for patients and public.

Whilst oral health has improved dramatically over the decades, dental caries (tooth decay) remains a significant public health problem. In common with most chronic health conditions, oral disease correlates closely with social and economic circumstances and the differences that exist between the most and least deprived in our society result in inequalities in oral health.

We are involved in a range of research projects which aim to enhance the evidence base for improving oral health and delivering dental care. While our work is based in Wales and we have a particular interest in oral health in the Principality, our collaborations and the outcome of our work is of relevance, locally, nationally and internationally.

We work closely with colleagues in Cardiff and Vale Local Health Board, Public Health Wales and the office of the Chief Dental Officer at Welsh Government. We contribute the Oral Health Workpackage of the Health Care Research Wales-funded Primary and Emergency Care Research (PRIME) Centre Wales (<http://www.primecentre.wales/>). We also host the Wales Oral Health Information Unit on behalf of Welsh Government and Public Health Wales.

Highlights of 2021:

- The PRIDA study led by Dr Anwen Cope, reached its conclusion. The aim of this study was to understand the role of shared-decision making in decisions about dental recall intervals in primary care. One of the outputs of this study was a 'decision support aid' which will facilitate discussions between patients and dentists about what is the best length of time between dental check-ups for each individual patient. This study was funded by Health and Care Research Wales.
- The OPTIMISE study, led by Professor Ivor Chestnutt, has been working to develop a model of skill-mix use in NHS General Dental Services to optimise the delivery of value-based, preventive-led care. The resulting product is a demand and skill mix optimisation model with a web-based user interface that can be used by service and workforce planners to explore different models of preventive care delivery. This study is nearing completion and will report in mid-2022. This study is funded by Health and Care Research Wales.
- The BRIGHT trial, a large randomised controlled trial, funded by the NIHR (£1.9M) and being conducted in collaboration with colleagues in the Universities of Dundee, Leeds, Sheffield and York continues, following the completion of a successful pilot stage. The study is looking at a school lesson followed by reminder text (SMS) messaging to improve toothbrushing behaviours in young people.

Our plans for 2022

We will continue to build on strong foundations of oral health improvement and health service research to pursue new research into urgent dental care, paediatric oral health and the provision of dental services. We have well established research collaborations with other dental schools, the NHS and wider academic primary care networks. Over the next 12 months we will grow these links and establish new national and international collaborations.

Key project summary:

A qualitative exploration of decisions about dental recall intervals. The attitudes of NHS general dental practitioners to NICE Guideline (CG19) on the interval between oral health reviews and perspectives of dentists and patients on the role of shared decision making in dental recall decisions

Scott H et al, 2021. Brit Dent J [in press]

Background: NICE Guideline CG19 recommends that the intervals between oral health reviews should be tailored to patients' disease risk. However, evidence suggests that most patients still attend at six-monthly intervals. Patients are sensitive to both the frequency and costs of dental recall visits. Shared decision making (SDM) is a principle of patient-centred care advocated by NICE and policymakers, whereby joint decisions are made between clinicians and patients.

Aims: (1) To explore facilitators and barriers to the implementation of CG19 in general dental practice. (2) To explore NHS dentists' and patients' attitudes towards SDM in decisions about recall interval.

Discovery: Semi-structured telephone interviews were conducted with 25 NHS general dental practitioners (GDP) in Wales, UK. Transcripts were thematically analysed.

Dentists described integrating information on clinical risk, patients' social and dental history and professional judgement when making decisions about recall interval. Although most GDPs reported routinely using risk-based recall intervals, a number of barriers exist to recall intervals at the extremes of the NICE recommendations. Many practitioners were unwilling to extend recall intervals to 24 months, even for the lowest-risk patients. Conversely

dentists described how it could be challenging to secure the agreement of high-risk patients to 3-month recalls. In addition, time and workload pressures, the need to meet contractual obligations, pressure from contracting organisations, and the fear of litigation also influenced the implementation of risk-based recalls. Whilst many patients would be happy to accept changes to their recall interval, most wanted to be seen at least annually. Most patients were willing to be guided by their dentist in decisions about recall interval, as long as consideration was given to issues such as time, travel and cost. This contrasted with the desire to actively participate in decisions about operative treatment. Although dentists' understanding of SDM varied, practitioners considered it important to involve patients in decisions about their care. However, dentists perceived that time, patient anxiety and concerns about potential adverse outcomes were barriers to the use of SDM.

Importance: Although awareness of NICE Guideline CG19 was high, there is a need to explore how risk-based recalls may be best supported through contractual mechanisms. Since there is uncertainty about the most clinically and cost-effective dental recall strategy, patient preference may play a role in these decisions.





Professor Ivor G Chestnutt

✉ ChestnuttIG@cardiff.ac.uk

☎ +44 (0)29 2074 6680

Ivor Chestnutt is Professor in Dental Public Health at School of Dentistry, Honorary Consultant to Cardiff and Vale University Health Board and is registered as a Specialist in Dental Public Health. He is a graduate of the University of Edinburgh (BDS 1985) and received both his MPH (1995) and PhD (1992) degrees from the University of Glasgow. He holds Fellowships in dental surgery and dental public health from the Royal College of Surgeons of Edinburgh (1990 and 1998), the Royal College of Physicians and Surgeons of Glasgow (2003) and the Royal College of Surgeons, England (2002). Ivor is a Fellow of the Faculty of Public Health (2003) and a Fellow of the Higher Education Academy (2006). He is also the Clinical Director of the University Dental Hospital in Cardiff and is Director of Postgraduate studies in the School of Dentistry.

Professor Chestnutt's research interests include dental health services research, clinical trials of preventive dental products and dental epidemiology.

Key Publication:

Mohd Nor NA, et al. (2021). Factors associated with dental fluorosis amongst Malaysian children exposed to different fluoride concentrations in the public water supply. *Journal of Public Health Dentistry*, online ahead of publication.

Full list at: www.cardiff.ac.uk/people/view/39480-chestnutt



Dr Anwen Cope

✉ CopeA1@cardiff.ac.uk

Anwen Cope is a Senior Clinical Lecturer in Dental Public Health at the School of Dentistry and an Honorary Consultant to Cardiff and Vale University Health Board. She is a graduate of Cardiff University (BDS 2009; PhD 2015; MPH 2018) and a Member of the Royal College of Physicians and Surgeons of Glasgow.

Dr Cope's research areas include the use of antibiotics in the management of dental problems in primary care; dental consultations in general medical practice; shared decision making in dentistry; and the use of skill-mix in the dental team.

Key Publication:

Scott H et al, (2021). A qualitative exploration of decisions about dental recall intervals. Part 1: attitudes of NHS general dental practitioners to NICE Guideline (CG19) on the interval between oral health reviews. *Brit Dent J* (in press)

Full list at: www.cardiff.ac.uk/people/view/337589-cope-anwen



Maria Morgan

✉ MorganMZ@cardiff.ac.uk

Prior to retiring in May 2021, Maria Morgan was a public health professional with academic and health service experience. She led the work of the Welsh Oral Health Information Unit funded by Welsh Government, which involved evaluating Designed to Smile, the national child oral health promotion programme. She also contributed to public health research and education and worked part-time as public health specialist for Public Health Wales.

Three main themes make up her research interests: public health nutrition, which continues early MPhil research; public health, both generic and dental, and dental epidemiology.

Key Publication:

Perry John, et al. (2021). Professional consensus on orthodontic risks - what orthodontists should tell their patients. *American Journal of Orthodontics and Dentofacial Orthopedics* 159(1): 41-52.

Full list at: www.cardiff.ac.uk/people/view/39445-morgan-maria

Orthodontics and 3D Imaging Research Group

We are a small group of multidisciplinary researchers addressing important issues in Orthodontic provision and Craniofacial development, facial shape and form with wide reaching and sustained impact.

www.cardiff.ac.uk/research/explore/research-units/orthodontics-and-three-dimensional-imaging-group

Our Goals:

We wish to improve patient outcomes and experiences in Orthodontics. To achieve these aims, we will carry out fundamental basic research via 3D surface imaging techniques with associated mathematical and computational approaches, and we will translate this research into clinical practice. We will guide our work by promoting fairness, openness, honesty, and equality, whilst ensuring quality and excellence in our research.

Research Group Website: www.cardiff.ac.uk/research/explore/research-units/orthodontics-and-three-dimensional-imaging-group

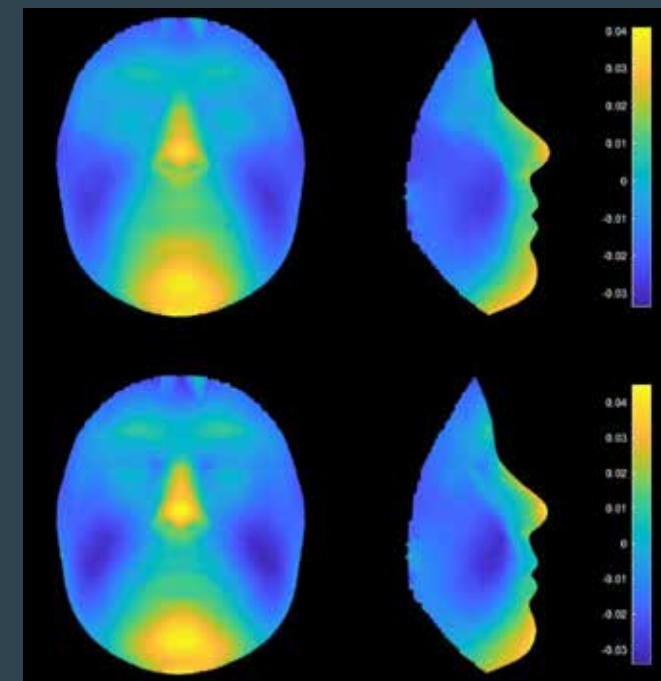


Fig 1: Colour map of the projection perpendicular to the surface at each point (blue indicates inward changes in mm and yellow indicates outward changes in mm) representing differences in shapes with age: features become more strongly defined with increasing age (12 to 17), where the chin and nose become larger in particular.

Highlights of 2021:

- Professor Richmond continued his work investigating the influence of genetics on facial shape with international collaborators. This resulted in two publications in *Nature Genetics*, two in *PLoS Genetics*, and one in *Frontiers in Genetics* (Hoskens et al., 2021, Indencleef et al., 2021, Liu et al., 2021, Naqvi et al., 2021, White et al., 2021).
- Dr DJJ Farnell published the results from a visit to KU Leuven, Belgium which develop a model of 3D facial shapes of 12 to 17 year old Welsh and Finnish faces (Figure 1): (DJJ Farnell et al, 2021. An Exploration of Adolescent Facial Shape Changes with Age via Multilevel Partial Least Squares Regression. *Computer Methods and Programs in Biomedicine* 200, 105935).
- Dr Jennifer Galloway was appointed as a Senior Clinical Lecturer and Honorary Consultant in Orthodontics and successfully defended her PhD thesis..
- Dr DJJ Farnell was awarded an Innovation Grant for £9480 from the Institute of Physics and Engineering in Medicine (IPEM) for eye-tracking equipment to study entitled: "How Do People Read "Designed To Smile" Information Leaflets? An Exploratory Mixed-Methods Approach". This research builds on previous work by the group in the field of eye-tracking.
- MScD student Camilla Miles-Hobbs won "Best Scientific Poster" prize at the European Orthodontic Society Congress 2021 for her research with colleagues in University of Bristol on "Exploring the impact of maternal exposures during pregnancy on hypodontia risk: a negative control experiment".

Our plans for 2022 :

Future research will focus on improving patient care in orthodontics (and beyond) by applying dental imaging modalities, especially 3D surface imaging. Including:

3D surface scanning:

- The consequences of dental treatment on the dental arches, facial shape and facial dynamics.
- Understanding facial aging.
- Determinants of facial and cranial shape.
- Face mask design (both reusable and disposable).

Forensics:

- Imaging of accidental and abusive bruises.

Eye-Tracking

- Capturing a "patient's eye view" of the orthodontic environment in the COVID era.
- What do clinicians look at when they carry out orthodontic interventions?
- Facial Aesthetics: A mixed-methods study, including eye-tracking.

Optimising patient pathways:

- Investigating and improving patient pathways using machine learning.



Key project summary:

Establishing the evidence base for risk communication in orthodontics

Perry J et al, 2021. Am J Orthod Dentofacial, Orthop 159(1): 41-52.

Perry J et al, 2018. J Dent 74: 61-70.

Background: For valid consent, the potential risks of orthodontic treatment must be explained to patients. However, prior to this body of work, the content of discussions about risks with patients was not informed by agreed standards. This project aimed to establish an evidence base for risk communication in orthodontics.

Discovery: This project used sequential mixed methods. In phase one, the opinions of professionals were gathered using a two-round e-Delphi survey. This methodology aims to gain consensus amongst a group of individuals by asking each participant to rate the relative importance of a number of statements. Orthodontic professionals were asked to determine whether each orthodontic risk was “not important” or “critical” to discuss on a 1-9 scale. In phase two, the opinions of adolescents were gathered using qualitative focus groups. Data from the two phases was compared using triangulation.

The e-Delphi survey was completed by 237 orthodontists based in the United Kingdom. Consensus was gained for the inclusion of 10 risks in orthodontic risks discussions. Across four focus groups, 32 adolescents discussed

orthodontic treatment and risks. Four themes emerged: (a) engaging with information on risks when making decisions; (b) oral health to prevent and manage treatment risks; (c) the daily risks of brace treatment; and (d) important information about the risks of braces.

Importance: When triangulating the information gathered from phase one and two, there was some agreement between professionals and adolescents. However, the significance attached to some risks differed between the groups. Professionals agreed the following risks should be discussed: demineralisation (marks and holes developing on teeth), relapse, resorption (root shortening), pain, gingivitis, ulceration, appliance breakages, failed tooth movements, treatment duration and consequences of no treatment. Adolescents were most concerned with the “here and now” risks, whereas the professional body were more uncertain about the significance that should be attached to these risks.

Overall, this project has established a list of risks that should be discussed with patients. It is recommended that these risks are communicated during the consent process.



Dr Damian JJ Farnell

✉ FarnellD@cardiff.ac.uk

☎ +44 (0)29 2251 0618

BSc (Mathematical Physics) Departments of Mathematics and Physics, UMIST, (1991). PhD (“Integrable and Non-Integrable Quantum Arrays”) Department of Mathematics, UMIST, (1994). Post-Doctoral Research Associate, Universities of Manchester, Leeds, Munich, and Cologne, 1996-2003, 2007-2011. Lecturer of Ophthalmic Imaging, St. Paul's Eye Unit, Royal Liverpool University Hospital Trust, University of Liverpool, 2003- 2006. Senior Lecturer of Mathematics, Division of Mathematics and Statistics, University of South Wales, 2011-2014. Since 2014, Senior Lecturer of Applied Mathematics in Dentistry, School of Dentistry.

Research interests: Medical imaging and image processing; Medical and dental research: epidemiology & statistical analysis of laboratory and clinical studies data; Mathematical Biology; Quantum magnetism, especially “frustrated” magnetic systems

Key Publication:

Harrop E et al, (2021). Support needs and barriers to accessing support: Baseline results of a mixed-methods national survey of people bereaved during the COVID-19 pandemic. Palliative Medicine (online ahead of publication)

Full list at: www.cardiff.ac.uk/people/view/39526-farnell-damian



Dr Jennifer Galloway

✉ Gallowayjl@cardiff.ac.uk

☎ +44 (0)29 2074 2447

BMSc (1st class Hons) in Anatomy and Forensic Anthropology, University of Dundee, 2010. BDS with Commendation, University of Dundee, 2013. MDSc by Research, “Exploring the link between TGF 3 and hyaluronan synthesis in cleft palate development”, University of Dundee, 2013. MFDS, Royal College of Physicians and Surgeons Glasgow, 2015. MOrth, Royal College of Surgeons Edinburgh, 2019. PhD, “Investigating facial shape

using multilevel principal component analysis”, Orthodontic Department, Cardiff University, 2021. Specialty Registrar in Orthodontics, Royal Glamorgan Hospital and University Dental Hospital Cardiff, 2016-19. Post-CCST in Orthodontics, Morriston Hospital, 2019-21. Currently, Senior Clinical Lecturer and Honorary Consultant in Orthodontics, Cardiff University, 2021 – present.

Research interests: Previous experience in cleft palate development, modelling of 3D facial shape and dental health economics. Current research interest in optimising orthodontic patient care pathways.

Key Publication:

Farnell DJJ et al. (2021). An exploration of adolescent facial shape changes with age via multilevel partial least squares regression. Comput Methods Prog Biomed 200: 105935

Full list at: <https://www.cardiff.ac.uk/people/view/2564725-galloway-jennifer>



Professor Stephen Richmond

✉ RichmondS@cardiff.ac.uk

☎ +44 (0)29 2074 2451

BDS (1979), DOrth, RCS (1984), MScD (1984), FDS,RCS (Ed) (1985), CHT, RCS (1989), PhD (1990), FDS.

Research interests: Wide variety of research involving orthodontic provision, orthodontic treatment need and outcomes as well as the interface with many disciplines using 3D facial imaging.

Key Publication:

Naqvi S, et al. (2021). Shared heritability of human face and brain shape. Nature Genetics 53: 830-839.

Full list at: www.cardiff.ac.uk/people/view/39436-richmond-stephen



Dr Alexei Zhurov

✉ ZhurovAI@cardiff.ac.uk

☎ +44 (0)29 2251 0619

BSc Applied Maths, MIPT (1988), MSc Applied Maths, MIPT (1990) Dolgoprudny, Russia. PhD Applied Maths, IPM RAS, Moscow, Russia (1995). Since 2001 Research Officer, Biomechanics and 3D Imaging Applied Research and Public Health.

Research interests: Three-dimensional analysis of the human face, contact biomechanics, biomechanics of soft tissues and FEM simulation. Theory of heat and mass transfer and chemical hydrodynamics. Nonlinear differential equations and exact solutions. Dynamic systems and computer algebra.

Key Publication:

Farnell DJJ et al, (2021). An exploration of adolescent facial shape changes with age via multilevel partial least squares regression. Comput Methods Prog Biomed 200: 105935

Full list at: www.cardiff.ac.uk/people/view/39394-zhurov-alexei

Alcohol and Violence

Through practical research on alcohol-related harms and violence, our leading academics, working in collaboration with external partners and organisations, have helped to understand, monitor and alleviate the causes of alcohol-related harms and violent behaviour.

www.cardiff.ac.uk/violence-research-group

Our goals:

- Carry out a study to determine whether bespoke alcohol treatment services are an effective way to treat acutely intoxicated people and reduce the burden on overstretched emergency services.
- Research the pathways into alcohol use and misuse, including their life-course effects on health and well-being.
- Report annually from the National Violence Surveillance Network
- Roll out the Cardiff Model in other countries
- Assess the Causes of Alcohol-fuelled Violence

The Violence Research Group draws on expertise from across Cardiff University. The strength and reputation of the group comes from its interdisciplinary research across the fields of psychiatry, public health, dentistry, criminal justice, police, psychology, materials science, computer science, social science and economics; and its extensive record of innovation and contributions to policy and alcohol-related harms and violence prevention.

Highlights of 2021:

- The VRG are working closely with the NHS, Violence Prevention Units and Public Health Wales to better understand how Emergency Care pathways can better identify and support those exposed to violence.
- Modelling alcohol consumption data in middle-aged drinkers, suggests that a £0.50 minimum unit price for alcohol, which has been implemented in Wales and Scotland, may not provide the reduction in alcohol-related health harms initially envisaged.
- Analysis of assault-related injury data from Emergency Departments suggests that licensed premises lockdowns, mitigations in response to the SARS-CoV-2 pandemic, resulted in fewer assaults outside of the home, but violence in the home remained stable.
- Work in collaboration with the Welsh Government found alcohol-related brain damage is likely under diagnosed, and there are needs to better improve services in this area.

Our plans for 2022 :

- We will continue to engage broadly across local, national, and international partners who have the shared interests of tackling the causes of violence and helping those most affected by violence. Over the next 12 months, we will launch several newly funded projects and continue to work towards a measurable difference to levels of violence.
- We will publish our analysis of assault-related injury attendances presenting to A&E, one of the most reliable measures of serious violence,
- We will launch a new project aiming to understand how Emergency Care pathways can react to patients exposed to violence and address any underlying causes,
- We aim to develop insights into how social media can influence rates of violence and if there are opportunities to use these platforms to intervene and reduce violence.



Key project summary:

Association Between COVID-19 Lockdown Measures and Emergency Department Visits for Violence-Related Injuries in Cardiff, Wales

Shepherd JP et al, 2021. JAMA325(9):885–887

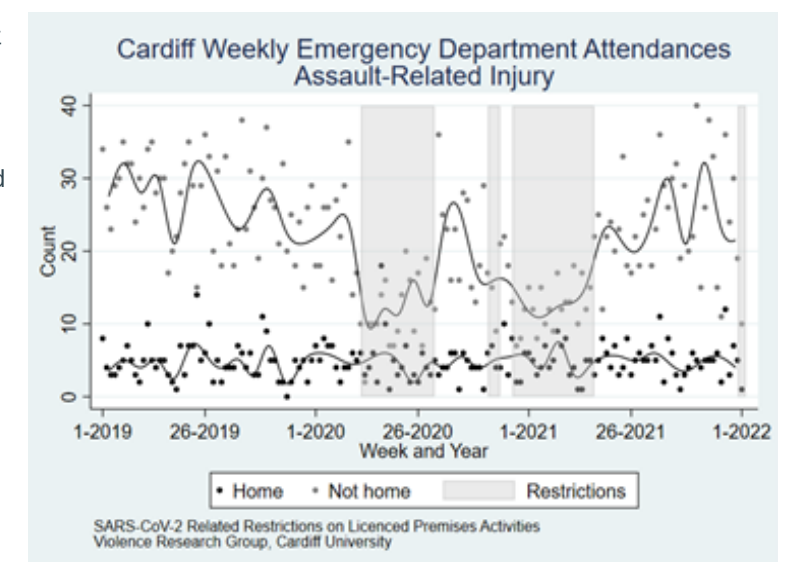
Background: Government policy responses to coronavirus disease 2019 (COVID-19), especially social distancing measures, have generated speculation on behavioural health effects, including interpersonal violence, domestic violence, and child abuse.

1. We investigated the association between COVID-19 lockdown and emergency department (ED) visits for violence-related injuries in Cardiff, Wales, using detailed violence screening for all ED patients.
2. We hypothesised that lockdown measures would decrease violence outside the home but would increase violence at home.

Discovery: A significant decrease in ED visits in Cardiff by people injured by violence followed the UK lockdown, driven by a large reduction in ED visits due to violence outside the home. No significant increase in ED visits resulting from violence at home was noted.

Importance: Many organisations expressed concern that one potentially deleterious effect of COVID-19 mitigations would be an increase in domestic

violence, due to significant restrictions to activities and spending an increased proportion of time at home. Our analyses suggest this concern did not materialise and should not be used in determining the net effect of lockdown.





Professor Simon C Moore

✉ MooreSC2@cardiff.ac.uk
☎ +44 (0)29 2251 0609

Professor of Public Health Research, Director of Alcohol & Violence Research Group, Co-director of the Crime and Security Research Institute, publicly appointed by the Welsh Minister for Health as an advisor to the Welsh Government on matters relating to alcohol misuse and substance abuse.

The aim of my research is to translate basic-level, fundamental science and apply it to the real world in order to improve community safety and the health of our communities. My work is multi-disciplinary, crossing psychology, neuroscience, economics, medicine, public health and other disciplines and typically involves practitioners and policy makers. All projects have a clear impact pathway, whether that is to inform policy and practice directly or to seed further work such as an implementation trial. Methods include “big data” data linkage projects, randomised controlled trials, computer modelling and simulation and various other approaches.

Key Publication:

Shepherd J et al, (2021). Association between COVID-19 lockdown measures and emergency department visits for violence-related injuries in Cardiff, Wales. JAMA 325(9): 885–887

Full list at: www.cardiff.ac.uk/people/view/39454-moore-simon-c



Professor Jonathan Shepherd

✉ ShepherdJP@cardiff.ac.uk

Professor Emeritus of Oral and Maxillofacial Surgery, Professor at Cardiff University's Crime and Security Research Institute. Professor, Violence Prevention Unit for Wales. Honorary Professor at Deakin University, Australia. Fellow of the Academy of Medical Sciences. Fellow, Learned Society of Wales. Publicly appointed by the Home Secretary to the Home Office Science Council, representing the Academy of Medical Sciences. NHS representative on the Welsh Government's ministerial Violence against Women and Domestic Abuse Advisory Board. One of two academics on the UK's £200 million Youth Endowment Fund grants and evaluation committee. Commissioner, UK Commission on

Alcohol Harms. Founder trustee of the Chartered College of Teaching and inaugural chair of the College's journal and research committee which oversaw the development and launch of the new journals, Impact and The Profession. Member, Campbell Collaboration Crime and Justice Group. Member, Welsh Government Advisory Committee on Clinical Excellence Awards. Trustee, Hunterian Museum, Royal College of Surgeons of England. Lindsay Society Lecturer 2021.

My research on clinical decisions, violence, and the evidence ecosystem has made many contributions to clinical and public policy and to legislation. Prompted by my discoveries I initiated and developed the Cardiff Model for Violence Prevention which has been widely implemented across the UK and in cities overseas including in Colombia, Jamaica, Australia, and the United States supported by the Centres for Disease Control and Prevention and the World Health Organisation. I initiated and with the Home Office and Ministry of Justice developed the UK's College of Policing and Probation Institute. My proposals for new national institutes to guide education, policing, and other public services - bodies equivalent to the National Institute for Health and Care Excellence (NICE) which guides the NHS - and a new forum where public services can share expertise about evidence, were taken up by the UK government in the form of the What Works Centres and the Cabinet Office What Works Council.

Key Publication:

Shepherd JP, et al. (2021). Association between COVID-19 lockdown measures and emergency department visits for violence-related injuries in Cardiff, Wales. Journal of the American Medical Association 325(9): 885-887

Full list at: www.cardiff.ac.uk/people/view/39410-shepherd-jonathan



Professor Vaseekaran Sivarajasingam

✉ Sivarajasingam@cardiff.ac.uk
☎ +44 (0)29 2251 0608

Professor of Oral Surgery and Consultant Oral Surgeon. Director of National Violence Surveillance Network of Emergency Departments in England and Wales. Core member of the Welsh Government, Emergency Care Data Set Implementation Group.

As Director, I continue to develop the National Violence Surveillance Network (NVSN) of Emergency Departments in England and Wales and lead collaboration with the Office for National Statistics on violence measurement. This common interest led to co-production of a joint compendium on child abuse (2020), utilising NVSN data on injuries sustained in violence for those aged 0 to 18 years. Research on violence surveillance, alcohol intoxication management services & evaluation (UK) & research to inform minimum unit pricing policy are drivers for Cardiff University REF 2021 impact case. In these projects (which sit at the interface between clinical and academic research), I was clinical lead (idea generation, NHS ethics, patient recruitment and data quality) and maximised opportunity for outputs to align with clinical practice.

Key Publication:

Sivarajasingam V, et al. (2021). Violence in England and Wales in 2020: an accident and emergency perspective. Cardiff: Crime and Security Research Institute, Cardiff University.

Full list at:

www.cardiff.ac.uk/people/view/39421-sivarajasingam-vaseekaran

Improving Dentistry

Our research focuses on improving the delivery, experience and effectiveness of clinical dentistry through systematic review and data syntheses to understand the evidence, followed by applying primary research (clinical trials, observational studies, qualitative research) to fill the gaps in knowledge and then translating the evidence to practice, policy and education.

Dental caries is almost completely preventable yet has a significant health and economic global burden. It is the commonest childhood disease affecting around 90% of children in low- and middle-income, and 30-50% in high-income, countries.

The establishment of the dental profession as a surgical specialty in the late 19th century laid the pathway for dental disease to be managed using mainly operative techniques. This surgically focussed approach has continued with little change despite its failure to yield significant individual or public health benefits, as evidenced by widespread high levels of disease and huge global treatment costs. Similarly, the education of dental professionals has largely followed a model with biological science paving the way for clinical skills and social sciences supplementing this to support professionalism, care of patients and behaviour management and more recently modification.

The understanding of dental caries as a biofilm-based disease mediated by behaviour has been harnessed to realise gains in prevention and management of disease. Our clinical trials and work with patients have shown the Hall Technique, Atraumatic Restorative Treatment and application of silver diamine fluoride can manipulate the carious biofilm, reduce its cariogenicity and therefore the impact on patients, improving outcomes for children over traditional surgical treatments. These dental procedures are less invasive and do not generate aerosol, bringing additional advantages where aerosol and droplet production should be avoided. Reducing the invasiveness of treatment brings a quarternary prevention approach to care, reducing the burden of treatment and associated costs, to patients and society. However, there are barriers to introducing novel treatments and approaches to the profession and the translation of research findings to clinical practice is often not realised, with the reasons being poorly understood, leaving a significant gap between the actual and potential impact of research and wastage in research funding.

Our goals are to use clinical trials, observational studies, qualitative research and evidence syntheses to:

- gain the greatest research impact for patients, oral healthcare professionals and other stakeholders, by working with them to identify needs
- improve the management of dental caries for our patients, especially those with a high disease burden, limited access to dental care and who are marginalised
- understand the carious biofilm and how to manipulate it to manage the disease dental caries
- improve the evidence base informing policy and teaching around cariology, paediatric and restorative dentistry
- understand and address barriers to implementation of evidence-based dentistry

Highlights of 2021

- The BRIGHT Trial (£1.9M NIHR HTA funded UK wide randomised control trial) investigating the clinical and cost-effectiveness of a school-based lesson and SMS text messaging to young people as reminders to toothbrush is on the final stage of data collection in secondary schools, despite being compromised by the pandemic.
- Publication of a systematic review of droplet and aerosol generation in dentistry. The findings were used to inform UK-wide dental guidance and policy during the pandemic. Innes N, Johnson IG, Al-Yaseen W, Harris R, Jones R, KC S, McGregor S, Robertson M, Wade WG, Gallagher JE. A systematic review of droplet and aerosol generation in dentistry. Journal of Dentistry 2021 105: 103556 <https://doi.org/10.1016/j.jdent.2020.103556>
- NIHR HTA award of £1.7M funding of the CALM Trial to investigate the “clinical and cost-effectiveness of a guided self-help cognitive behavioural therapy intervention to reduce dental anxiety in children”. Co-applicant (Sheffield University lead institution/ PI Zoe Marshman, Kings College London, Newcastle University, Leeds University, and York Trials Unit, University of York <https://fundingawards.nihr.ac.uk/award/NIHR131805>
- Initiation of a primary care dental research network across Wales.

Our plans for 2022 :

- We will build on our initial success with continuing to bring together a primary care network across Wales to identify and focus on problems in clinical dentistry that research might help to answer.
- We will set up and start the NIHR funded CALM Trial.
- We will complete the BRIGHT Trial, submit the report to the NIHR and start to publish the final results.
- We are investigating the possibility of setting up primary care practice “upskilled” Child Focussed practices and will evaluate their success.

Key project summary:

Investigating droplet and aerosol generation, spread and settle by dental procedures to inform practice and policy across the UK.

Innes N et al, 2021. J Dent 105: 103556,
Gallagher JE et al, 2021. BDJ Open6(1): 25,
Johnson IG et al, 2021. BDJ Open 7:15

Background: The global delivery of dental care and dental training was reduced and, in some cases, halted as a result of the COVID-19 pandemic. It has led to re-evaluation of infection control standards in dentistry. However, there has been a lack of clarity around what is known about droplets and aerosols generated during dental procedures and their potential to transmit disease. Areas most affected included dental and oral surgery procedures which involved procedures commonly using instruments that generate aerosols, notably rotary handpieces and ultrasonic scalers.

Policy to re-open practices could not be confidently formulated based on evidence as there was such a lack of understanding of the potential for aerosol and splatter to spread through dental procedures. A UK-wide group of experts came together to address this uncertainty around aerosol generating procedures (AGPs) in dentistry by looking at what was already known.

Objectives: The reviews aimed to identify which dental procedures generate droplets and aerosols with subsequent contamination, and for these, characterise their pattern, spread and settle.

Discovery: We searched six databases and used high quality systematic review methodology to identify papers, extract data, assess studies' quality/ risk of bias and synthesis findings.

We found 83 studies that fitted our criteria. There were 44 studies looking at ultrasonic scaling, 31 that investigated high speed air-rotors, 11 involving oral surgery procedures, four with slow-speed handpieces, four with air-water (triple) syringes, four with air-polishing, two with hygiene prophylaxis and two with hand-scaling procedures. They used widely varying methodologies.

We did not find any studies directly investigating spread and settle of respiratory viruses. Some studies used bacteria to

investigate contamination as an indirect measure of aerosol and droplet spread and settle. They did this, for example, by placing petri dishes around the dental surgery to collect and cultivate them following dental procedures. Other studies used similar methods but used blood or fluorescein placed in water supplies used during the dental procedures and detection methods for them.

Powered devices generated the highest levels of contamination and all dental activities investigated showed droplet and/or aerosol detectable at all distances studied across the surgery space. The operator's torso, arm and the patient's body seemed to be most affected.

The varied methodologies meant we could not directly combine different studies. However, some studies compared procedures and instruments within them and, using a network approach, a "hierarchy" of risk of contamination for different procedures was created.

This body of research is ongoing as new studies have been undertaken to fill some of the gaps we have identified and the research group are working on updating the work and including more detailed work on different types of rotary instruments.

Importance: This was a large and challenging dataset to work with. The significant gaps in evidence we found, the low sensitivity of the measures used, their indirect nature and variable quality, all limited the ability to draw conclusions around contamination for procedures. However, we were able to draw some conclusions around a continuum of instrument-related aerosol generation. Previously a binary AGP or non-AGP perspective had been taken. The findings informed discussion around AGPs, policy making in national and UK-level groups and also directed future research to support knowledge and decision making around COVID-19 and dental procedures.



Dr Waraf Al-yaseen

✉ Al-YaseenW1@cardiff.ac.uk

Waraf Al-yaseen is a Lecturer in Dental Hygiene Therapy in the Paediatric Dentistry Department of the School of Dentistry. She obtained her BDS in 2010, Baghdad, Iraq. From the University of Dundee, she then obtained her MSc in Paediatric Dentistry in 2014, Masters in Dental Public Health (2016), Diploma in Medical Education (2019) and PhD (2020). She has Membership of the Royal College of Surgeons of Edinburgh (2018).

Dr Al-Yaseen's research interests are around factors involved in failure to translate research to practice and in particular dental graduates changing relationship with evidence-based practice. She has expertise in qualitative research and systematic reviews.

Key Publication:

Johnson IG, et al. (2021). Dental periodontal procedures: a systematic review of contamination (splatter, droplets and aerosol) in relation to COVID-19. BDJ Open 7: 15.

Full list at: www.cardiff.ac.uk/people/view/2507596-alyaseen-waraf



Professor Nicola Innes

✉ InnesN@cardiff.ac.uk

Nicola Innes is a Professor of Paediatric Dentistry, Honorary Consultant and Head of Cardiff Dental School. She obtained a PhD (2011), a BDS(hons) (1998), and a BMSc (1995) in Molecular and Cellular Pathology from the University of Dundee as well as a BSc (1991) in Life Sciences from Napier University, Edinburgh. She has membership of the Royal College of Surgeons of England for the Faculty of General Dental Practitioners (2004) and the Faculty of Dental Surgery (2005).

Professor Innes' research is based around improving dental care and its delivery, in particular for children. Her main research areas are: cariology (minimal intervention dentistry), paediatric (Child Friendly) dentistry, oral health care and prevention for marginalised communities, evidence-based dentistry and addressing gaps in translating knowledge to practice. Her expertise is in primary research through clinical trials/ observational studies and secondary systematic reviews/ data syntheses. She works with international clinical trial groups in Australia, Brazil, Germany, Latvia, the Netherlands, New Zealand and the USA.

Key Publication:

Schwendicke F, et al. (2021). Interventions for treating cavitated or dentine carious lesions (Review). Cochrane Database of Systematic Reviews 7(7): CD013039.

Full list at: www.cardiff.ac.uk/people/view/2423223-innes-nicola



Rhiannon Jones

✉ JoneRJ5@cardiff.ac.uk

Rhiannon Jones is a Research Assistant in Dental Education and Innovation and previously in Dental Public Health. She obtained an MSc in Health Promotion in 1997 and has worked on a wide range of research projects.

Her recent research has been based on professionalism in dentistry, and the preparedness of the new graduate for the transition to independent practice. Rhiannon has experience in both qualitative and quantitative research methods and systematic reviews. Current research focus extends to paediatric dentistry, assisting in a UK trial (CALM) assessing the effectiveness of a cognitive behavioural therapy intervention delivered by primary care dentists to dentally anxious children. Rhiannon is also in the early phase of developing a primary dental care research network across Wales.

Key Publication:

Johnson IG, et al. (2021). Dental periodontal procedures: a systematic review of contamination (splatter, droplets and aerosol) in relation to COVID-19. BDJ Open 7: 15.

Full list at: www.cardiff.ac.uk/people/view/39397-jones-rhiannon



Dental Education, Scholarship and innovation

Our work focuses on developing excellence in dental educational, innovating for new educational approaches and supporting scholarship activities, networks and collaborations.

Our Ambitions:

To improve the educational experience of dental and oral health professional students internationally

Our Strategic areas for development:

- To encourage staff involvement with wider educator networks and learned societies, the development of educational resources, and the dissemination of information and knowledge to the wider international educational community;
- To champion research-led teaching and innovative and inspirational approaches to learning, including local, national and international policy change;

We work in close partnership with local, national and international organisations and stakeholders to improve the ways in which we educate our students and trainees. We are involved in a wide range of education research and development projects, curriculum reviews and policy consultations.

Highlights of 2021:

- Dr James Field launched the online DigEdDent platform, which aims to create an online platform to support educators in the delivery of digital dental education. This project was supported by ADEE - <https://adee.org/digeddent-digital-education-dentistry>
- As a project partner in the K2 Erasmus+ funded “O-Health-Edu” project (<https://o-health-edu.org/>), we have worked to harmonise the understanding and delivery of dental education across Europe, by:
- Publishing a scoping review on the reporting of oral health professional (OHP) education across Europe (10.1111/eje.12577)
- Developing a live, online glossary of educational terms for use in OHP education to facilitate a common understanding throughout Europe (<https://o-health-edu.org/articulate>)
- Creating a live, online data hub of dental schools across Europe, including details of the programmes that they offer, and important metrics. Cardiff was the first to submit its data, but the list is growing! (<https://o-health-edu.org/ohe-datahub-directory>)

Our plans for 2022

We aim to grow our influence as a community of dental educators, both locally, nationally and internationally. We will support our academic staff to engage with wider professional networks, develop and disseminate innovations, and drive for policy change. Our focus in the coming year will be on Sustainability, and the development of robust approaches to the use of digital workflows in dental education.

BARDES coming of Age?

Nearly 100 academics attended the 4th meeting of the British Alliance for Researchers in Dental Education and Scholarship (BARDES) in October of 2021; the meeting being hosted by the University of Glasgow Dental School.

A highly informative day delivered 2 excellent keynote lectures; one from Grant Creaney entitled “Sustainability: what should we be teaching the students?” and the other from Al Ross on “Incorporating Human Factors and Non-Technical Skills into the Undergraduate Dental Curriculum”. Additionally, 3 PhD presentations were warmly received from Dr Jamie Dickie -

‘Building validity evidence for longitudinal assessment of dental students’, Dr Claudia Cunningham – ‘Selection to Undergraduate Dental Education’ and Mr Rayan Sharka - “Perceived Risk Factors of Using Digital and Social Media in the General and Dental Professional Contexts”. Further short research presentations were delivered by Ms Faith Campbell on “Co-creation of a Comprehensive Intervention

to Facilitate Deep Reflection for Undergraduate dental students’, and a joint presentation was delivered by Professor Albert Leung and Dr Peter Fine, outlining the findings of an ADEE backed survey on the influence of Covid 19 on Feedback.

Attendee interaction and participation was key to the whole day with attendees exploring the topic “Working collaboratively with other Dental Schools” in workshops hosted by representative’s from BARDES. The workshops proved particularly useful and provided much discussion.

The group continues to go from strength to strength with an overriding wave of support to formalise the group’s

existence. A small working party has been organised under the guidance of Professor Janice Ellis to explore the establishing of a bone fide “Society” and work has already begun with the establishment of the mission statement ‘To connect and support dental education researchers and scholars to deliver an evidence base that informs the future delivery of exceptional dental education.’ and efforts to establish a web presence etc.

The Alliance will promote research into Dental Education and Scholarship through its articles and its commitment to

- Facilitate connectivity of providers of undergraduate and postgraduate dental education programmes to enable and enhance delivery of educational research
- Develop communities of practice with similar areas of interest and expertise
- Provide opportunity for networking through its activities, conferences, and web presence
- Provide support for members of the Alliance in the

form of access to expertise, mentorship, and academic resources

- Support the delivery of research projects by connecting researchers to relevant colleagues with a specific skill set and through the award of funding / grants.

- Support the growth development of early career colleagues and the discipline of dental education research

The next conference of BARDES will be held at the University of Liverpool, School of Dentistry in the Autumn of 2022. Cardiff dental school through its commitment to grow and establish research into Dental Education remains a key stakeholder and protagonist in the formalisation of this important research group.

Dr R McAndrew (Cardiff) on behalf of the BARDES Working Party: Professor Janice Ellis (Newcastle), Professor Barry Quinn (Liverpool), Dr Vivian Binnie (Glasgow), Dr Alison Cairns (Glasgow) Dr Claudia Cunningham (Aberdeen), Dr Zoe Freeman (Newcastle) Dr Melanie Nasseripour (Kings College London)), Dr Kim Piper (Kings College London).

Scholarship Dental
Research
BARDES
Alliance Education
Collaboration





Dr James Field

✉ Fieldj2@cardiff.ac.uk

Dr James Field is a Senior Lecturer in Restorative Dentistry, Honorary Consultant and Director of Learning and Teaching at Cardiff University's School of Dentistry. He obtained a BSc (Hons) in Zoology (2000), BDS (distinction, 2005) and a PhD (erosive tooth wear, 2012) from Newcastle University. Whilst undertaking specialist training, he also obtained a Master of Arts degree in Education (Edge Hill) and various certificates of learning and teaching in higher education. Dr Field is recognised by Advance HE as a Senior and

Principal fellow, and he also holds a National Teaching Fellowship. He is a Fellow of the Faculty of Dental Trainers, and a Fellow of the Academy of Medical Educators.

Dr Field's research and scholarship is based around improving dental education and curriculum reform. His main activities include leading the taskforces of the Graduating European Dentist curriculum and the Common Educational Framework for Dental Hygiene. He works with colleagues internationally to inform educational policy, drive curriculum innovation, and build educator networks to support innovation and improve the sharing of good practise.

Key Publication:

Quinn B, et al. (2021). COVID 19: The immediate response of European academic dental institutions and future implications for dental education. *European Journal of Dental Education* 24 (4): 811-814

Full list at: www.cardiff.ac.uk/people/view/2398618-field-james



Dr Robert McAndrew

✉ mcandrew@cardiff.ac.uk

Dr Robert McAndrew is a Clinical Senior Lecturer in Restorative Dentistry, Honorary Consultant, Director of Undergraduate Studies and Theme lead for Dental Education, Scholarship and Innovation at Cardiff University's School of Dentistry. He obtained a BDS (1986) from Dundee and an MSc (Dental Science, 1999), and a PhD (plastic restoration replacement, 2009) from Cardiff University. In 2006, Dr McAndrew is one of only two dentists in the UK to have completed a PGCE in Higher Education Leadership with Distinction and is a Fellow of Advance HE.

Dr McAndrew's ongoing interest lie in the development and education of dental undergraduates; in collaboration with colleagues from Newcastle and Glasgow Universities, he has been heavily involved in establishing the British Association for Research into Dental Education and Scholarship (BARDES). Dr McAndrew's research interests have evolved over the years but now mainly concentrate on student feedback in Education and the value of admissions processes in student selection. Dr McAndrew was instrumental in establishing the value of multiple mini-interviews as a selection tool in UK dental Schools with Cardiff dental School being the first dental school to adopt such in the UK.

Key Publication:

Freeman Z, et al. (2020). Understanding dental students' use of feedback. *European Journal of Dental Education* 24(3): 465-475.

Full list at: www.cardiff.ac.uk/people/view/39447-mcandrew-robert

PhD successes



Katrina Duggan

Thesis Title:

Biomaterial modulation for diagnostic and therapeutic benefit in catheter-associated urinary tract infection (CAUTI)

Supervisors:

Prof. David Williams, Prof. Mark Waters, Dr Ian Fallis and Dr Alison Paul

Summary: Urinary catheters are functional medical devices, designed to assist bladder emptying in incontinent or neurologically impaired patients, but their surfaces are susceptible to colonisation by microbial biofilms, particularly in patients with long-term, indwelling devices.

Microorganisms that colonise the skin, digestive tract and found in the environment can contribute to CAUTI incidence, with urease producing species causing formation of crystalline biofilms, leading to catheter blockage.

The overarching aim of my research was to evaluate a selection of biocidal agents against a panel of uropathogens, and to incorporate the leading candidates into silicone to prevent biofilm formation.

Triclosan and triclosan acetate were leading candidates in terms of minimum inhibitory concentrations (MICs) required to prevent bacterial growth (0.024 – 12.5 g/ml) and also in the broad range of species they were active against in planktonic culture. Silicone bulk-loaded with 1% w/w of triclosan and triclosan acetate demonstrated biocidal activity against *Proteus mirabilis*, *Providencia stuartii*, *Klebsiella pneumoniae* and *Staphylococcus aureus*, whilst the triclosan-loaded polymer was also biocidal against *Escherichia coli* and *Candida albicans*. *Pseudomonas aeruginosa* and *Serratia marcescens* were resistant to both silicone formulations. Importantly, HPLC analysis revealed that the silicones released triclosan over a 12 week period, with the triclosan acetate silicone demonstrating a slower, more sustained release.

Whole urinary catheters dip-coated with silicone containing 0.2% w/w triclosan and triclosan acetate prevented migration of *P. mirabilis* into the bladder chamber from the drainage bag when evaluated using an in-vitro bladder model, over a test period of 9 days. In contrast, bladders of models with uncoated catheters were infected after a mean of 6.7 days.

A novel 3D-printable formulation was also developed containing 1% w/w triclosan that inhibited growth of *P. mirabilis*, *E. coli* and *S. aureus* and had superior mechanical properties to its compression moulded counterpart.

A range of biosensors were developed to signal early CAUTI and thus, facilitate improved management. A previously developed bromothymol blue silicone sensor was structurally modified to allow earlier detection of *Proteus mirabilis*, and the commonly used cell viability dye, resazurin, was added to catheter drainage bags, signalling infection 40 h before catheter blockage occurred.



Jennifer Galloway

Thesis Title:

Thesis Title: Investigating facial shape using Multilevel Principal Component Analysis

Supervisors:

Professor Stephen Richmond, Dr Damian Farnell, Dr Alexei Zhurov

Summary: Facial shape is complex, with differences between individuals likely due to a combination of genetic and environmental factors. Facial shape is often captured using 3D facial scanning as this provides a non-invasive method of recording the facial surface. Facial landmarks can be used to summarise the faces in a manner that facilitates analysis. Multilevel Principal Component Analysis (mPCA) has been suggested as a useful tool for analysing facial shape data.

mPCA was used to investigate the influence of population, biological sex, height, BMI, age, pubertal stage, metabolic factors, breathing disorders, maternal smoking and alcohol consumption during pregnancy on adolescent facial shape. Multiple alternative analyses were used to confirm the results of the mPCA models.

In the respective mPCA models, population, biological sex, BMI, height and fasting insulin explained more than 5% of the total variation in facial shape. Differences due to population, biological sex, BMI and height made biological sense. Fasting insulin appeared to influence the prominence of the browridge and chin with differences in the findings between males and females. However, significance levels did not hold up to multiple testing for fasting insulin when analysed using Partial Least Squares Regression (PLSR).


Ultimately, this work shows that fasting insulin could be explored further to help improve understanding of facial shape development. Investigating whether fasting insulin influences the effectiveness of orthodontic treatments, particularly those that have historically aimed to adapt facial shape, would be useful. More far reaching, exploring whether controlling levels of fasting insulin could remove the need for some orthodontic treatment completely, would be interesting further work.

Publications

Galloway J et al (2020). Multilevel analysis of the influence of maternal smoking and alcohol consumption on the facial shape of English adolescents. *Journal of Imaging* 6(5): 34

Farnell DJJ, (2017). Initial results of multilevel principal components analysis of facial shape. In: Valdes-Hernandez, M Gonzalez-Castro V (eds) *Medical Image Understanding and Analysis*. MIUA 2017. Communications in Computer and Information Science, vol 723. Springer Cham.


Awards & Prizes




MScD student Camilla Miles-Hobbs won “Best Scientific Poster” prize at the European Orthodontic Society Congress 2021 for her research with colleagues in University of Bristol on “Exploring the impact of maternal exposures during pregnancy on hypodontia risk: a negative control experiment”.



Dr Petros Mylonas received the Emerging Leaders 2021 award – Surface Topography: Metrology and Properties (<https://iopscience.iop.org/journal/2051-672X/page/emerging-leaders-2021>).




Prof Rachel Waddington has taken up her position as President of the BSODR, the first female president in the Society's 53-year history.



Microbial Diseases PhD student, Rania Nassar received the 2021 IADR Colgate Research in Prevention Travel Award in recognition of her research entitled: Antimicrobial Activity of Phytic Acid: A Potential Endodontic Irrigant.



Prof Nicola Innes's publication, “Caries management options for primary molars: 2-year outcomes of a randomised clinical trial” published in Deutsche Zahnärztliche Zeitschrift was awarded best publication of 2021 by The German Society for Dental, Oral and Maxillofacial Surgery.

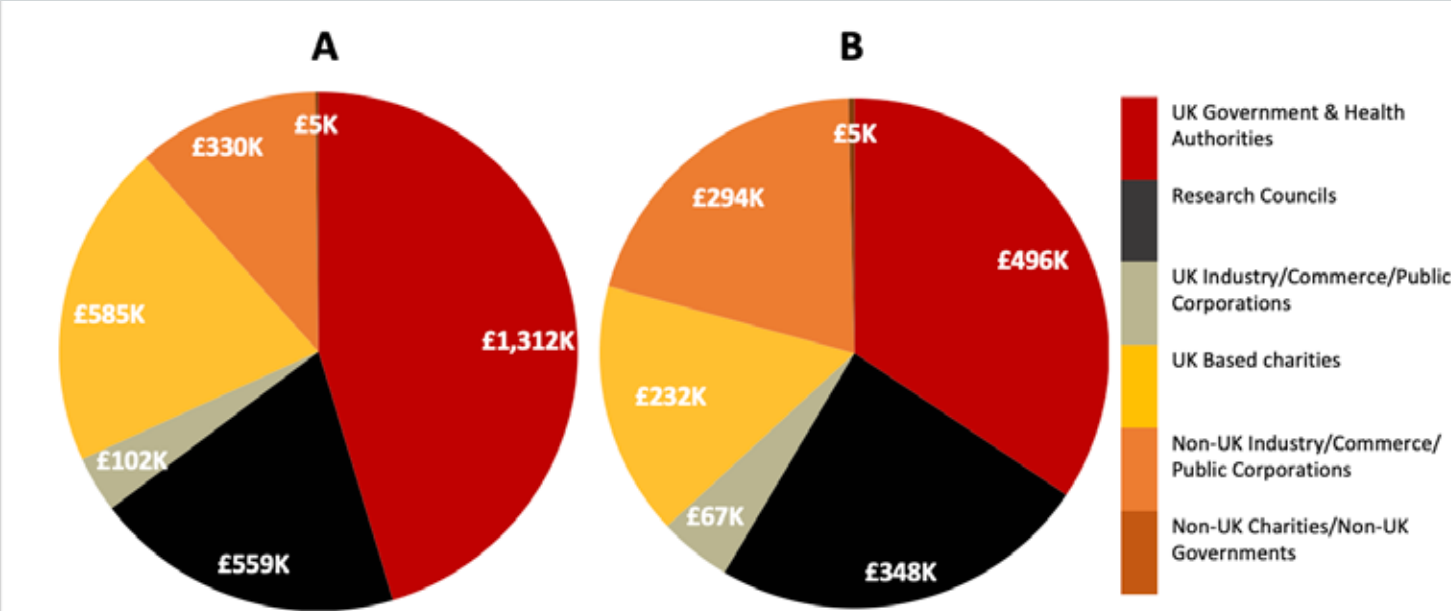


Ms Megan Williams was a recipient of a UK-Canada Global link award to undertake research with Dr Laurent Bozec at the University of Toronto. Her project will investigate nanoscale interactions of Candida species with oral bacteria and surfaces.

Research Funding

Overview of active grants

Our research groups were part of collaborative research awards with other institutions totalling £2,892K (A) for the financial year 2020-21, with £1,442K (B) being allocated to the School of Dentistry. Research funding for the financial year broken down per sector is given below.



Current major grants

List of substantial grants (≥ £500K) awarded since 2016 that involve our staff:

- Chestnutt I (co-I) et al, Welsh Government: Health and Care Research Wales. “Wales Centre for Primary and Emergency Care Research (PRIME).” £4,857K, 2020-25
- Aeschlimann D (co-I) et al, Arthritis Research UK: “Arthritis Research UK Biomechanics and Bioengineering Centre.” £2,200K, 2016-23
- Chestnutt I (co-I) et al, Welsh Government: Health and Care Research Wales: “PRIME Centre.” £1,800K, 2018-21
- Chestnutt I (co-I) et al, Welsh Government: “Wales Centre for Primary and Emergency Care Research (PRIME).” £1,266K, 2021-2023
- Innes N et al, NIHR, HTA: “BRIGHT Trial Brushing Reminder 4 Good oral Health: The clinical and cost effectiveness of a short messaging service behaviour change programme to improve the oral health of young people living in deprived areas.” £981K, 2020-2022
- Moseley R et al, QBiotics Ltd: “Elucidation of the underlying mechanisms of action by which novel epoxy-tiglane pharmaceuticals promote preferential wound healing responses.” £818K, 2016-23
- Thomas D (co-I) et al, Biotechnology and Biological Sciences Research Council: “Mapping the lipid envelope composition of SARS-CoV2 for reducing transmission, thrombosis and inflammation.” £604K, 2021-2022
- Knauper V (co-I) et al, Biotechnology and Biological Sciences Research Council: “The regulation of protective immunity to viruses by L-selectin.” £558K, 2019-22

New grants

New grants awarded to our staff in 2020-21 financial year (grants ≥ £40K per annum):

- Chestnutt I (co-I) et al, Welsh Government: “Wales Centre for Primary and Emergency Care Research (PRIME).” £1.266K, 2021-23
- Innes N et al, UK Government: “BRIGHT Trial Brushing RemInder 4 Good oral Health: The clinical and cost effectiveness of a short messaging service behaviour change programme to improve the oral health of young people living in deprived areas.” £981K, 2020-22
- Thomas D (co-I) et al, Biotechnology and Biological Sciences Research Council: “Mapping the lipid envelope composition of SARS-CoV2 for reducing transmission, thrombosis and inflammation.” £604K, 2021-22
- Moseley R et al, Dunhill Medical Trust: “Development of epoxy-tiglanes as novel small molecule therapeutics for impaired re-epithelialisation associated with non-healing, chronic skin wounds in the aged.” £298K, 2021-23
- Nishio Ayre W, Engineering and Physical Sciences Research Council: “Exploiting bacterial virulence for triggered antimicrobial release from orthopaedic implants.” £264K, 2021-23
- Aeschlimann D et al, Engineering and Physical Sciences Research Council: “Strategic investment in Cardiff University’s functional material capabilities.” £228K, 2020-22
- Ferguson E, Medical Research Council: “Potential of Lactobacillus-derived polysaccharides as novel bi-functional carriers in polymer conjugates.” £53K, 2021-22
- Williams D et al, National Biofilms Innovation Centre: “Novel XF drugs in the topical management of Candida albicans biofilms.” £48K, 2021

AMERICAS

Canada

University of Ottawa, Ottawa
University of Toronto, Toronto

USA

Emory University, Atlanta, GA
Centers for Disease Control and Prevention, Atlanta, GA
Medical College of Wisconsin, Milwaukee, WI
Columbia University, New York, NY
Colgate Palmolive, NJ
Celimmune, Lebanon, NJ
University of Nevada, Las Vegas, NV
University of California, Davis, CA
UCLA, Los Angeles, CA

Mexico

UNAM: Escuela Nacional de Estudios Superiores, León, Guanajuato

Brazil

University of Campinas, Campinas
Health Institute of Nova Friburgo, Fluminense Federal University, Nova Friburgo, Rio De Janeiro
School of Dentistry, Federal University of Paraíba, João Pessoa, Paraíba

Chile

Escuela de Salud Pública, Universidad de Chile, Santiago
Universidad de los Andes, Santiago

Colombia

Pontificia Universidad Javeriana, Bogotá D.C.a

ASIA

China

China Medical University, Shenyang
Dalian Medical University, Dalian
Fourth Military Medical University, Xi'an
Chinese Academy of Sciences Shenzhen Institute of Advanced Technology, Shenzhen
Chinese Academy of Medical Sciences, Beijing
University of Hong Kong, Hong Kong
Xiamen University, Xiamen
Xian Jiaotong Liverpool University, Suzhou

Japan

Osaka Dental University, Osaka
Nagoya University, Nagoya

Israel

Tel Aviv University, Tel Aviv

Iran

Isfahan University, Isfahan

Malaysia

Faculty of Dentistry, University of Malaya, Kuala Lumpur

Thailand

Faculty of Dentistry, Chiang Mai University, Chiang Mai

India

Manipal University, Manipal

UAE

Mohammed Bin Rashid University of Medicine and Health Sciences, Dubai

Saudi Arabia

King Abdullah International Medical Research Center (KAIMRC), Riyadh

AFRICA

Namibia

University of Namibia, Windhoek,

Ghana

University of Ghana, Accra

Egypt

Egyptian Knowledge Partnership

AUSTRALASIA

Australia

Deakin University, Victoria
QBiotics Ltd, Yungaburra
University of the Sunshine Coast, Queensland
QIMR Berghofer Medical Research Institute, Brisbane
University of Queensland, Brisbane
Melbourne Dental School, Melbourne
School of Health Sciences, The University of Newcastle
Monash University, Melbourne

New Zealand

University of Waikato, Hamilton

EUROPE

Belgium

Katholieke Universiteit Leuven, Leuven
University College Leuven-Limburg, Leuven

Croatia

University of Rijeka, Rijeka

Denmark

Technical University of Denmark, Kongens Lyngby

Finland

University of Tampere, Tampere
University of Oulu, Oulu University
Hospital MRC United Paper Mills, Helsinki

France

IAb Ltd, Lyon
Institut de Biologie et Chimie des Protéines, Lyon
Institut Laue-Langevin, Grenoble
University of Angers, Angers
Descartes University, Paris
Université Clermont-Auvergne, Clermont-Ferrand

Germany

Zedira, Darmstadt
Fraunhofer IGB, Stuttgart
University of Cologne, Cologne
Friedrich-Alexander-Universität, Erlangen-Nürnberg
Charité – Universitätsmedizin Berlin

Hungary

University of Debrecen, Debrecen
Semmelweis University, Budapest

Ireland

University College Cork, Cork
Trinity College, Dublin

Italy

University of Trieste, Trieste
University of Trento, Trento
University of Brescia, Brescia

Latvia

Riga Stradins University, Riga

Netherlands

Erasmus University, Rotterdam
Philips Healthcare, Eindhoven
Radboud University, Nijmegen

Norway

University of Bergen, Bergen
University of Oslo, Oslo
SINTEF, Trondheim
Alpharma AS, Sandvika
Norwegian University of Science and Technology (NTNU), Trondheim

Portugal

Universidade Católica Portuguesa, Lisbon
Instituto de Ciências da Saúde, Universidade Católica Portuguesa, Lisbon

Russia

State University of Environmental Engineering, Moscow, Russia

Slovakia

Institute of Molecular Biology, Slovak Academy of Sciences, Bratislava

Slovenia

University of Ljubljana, Ljubljana, Slovenia

Spain

Faculty of Dentistry, University of Granada, Campus Cartuja, Granada
Universitat de Barcelona, Barcelona
Adema Escuela, Universitaria de Odontología, Palma, Majorca

Sweden

Karolinska Institute, Stockholm
Malmö University, Malmö

Publications 2021

Ahmed H M A, Ibrahim N, Mohamad N S, Nambiar P, Muhammad R F, Yusoff M, Dummer P M H. (2021). Application of a new system for classifying root and canal anatomy in studies involving micro-computed tomography and cone beam computed tomography: explanation and elaboration. *International Endodontic Journal* 54(7): 1056-1082. doi: 10.1111/iej.13486

Ahmed Hany Mohamed Aly, Hashem Ahmed Abdel Rahman, Dummer Paul Michael Howell. (2021). Application of a new system for classifying root and canal anatomy in clinical practice – explanation and elaboration. *European Endodontic Journal* 6: 132-142. doi: 10.14744/eej.2021.38257

Alaidaroos Nadia Y A, Alraies Amr, Waddington Rachel J, Sloan Alastair J, Moseley Ryan. (2021). Differential SOD2 and GSTZ1 profiles contribute to contrasting dental pulp stem cell susceptibilities to oxidative damage and premature senescence. *Stem Cell Research and Therapy* 12(1): 142. doi: 10.1186/s13287-021-02209-9

Alazmah A, Parekh S, Bhatia S, Ashley P. (2021). Developing a child patient satisfaction survey: a quality improvement project *European Archives of Paediatric Dentistry* 22: 209-217. doi: 10.1007/s40368-020-00567-1

Alrashidi Amal, Jafar Mohammed, Higgins Niamh, Mulligan Ciara, Varricchio Carmine, Moseley Ryan, Celiksoy, Vildan, Houston David MJ, Heard Charles M. (2021). A time-kill assay study on the synergistic bactericidal activity of pomegranate rind extract and Zn (II) against Methicillin-Resistant *Staphylococcus aureus* (MRSA), *Staphylococcus epidermidis*, *Escherichia coli*, and *Pseudomonas aeruginosa*. *Biomolecules* 11: 1889. doi: 10.3390/biom11121889

AlSaleh E, Dutta A, Dummer PMH, Farnell DJJ, Vianna ME. (2021). Influence of remaining axial walls on of root filled teeth restored with a single crown and adhesively bonded fibre post: A systematic review and meta-analysis. *Journal of Dentistry* 114: 103813. 10.1016/j.jdent.2021.103813

Al-Sultani Hassan, Breckons Matthew, Field James, Thomason Mark, Moynihan Paula. (2021). Development of patient-centric eating advice for complete denture wearers. *Gerodontology* (in press).

Aresi Giovanni, Marta Elena, Moore Simon C. (2021). Youth mobility, mental health and risky behaviours 427-439 Aresi, Giovanni, Marta, Elena and Moore, Simon C. (2021). Youth mobility, mental health and risky behaviours. In Cairns, David ed. *The Palgrave Handbook of Youth Mobility and Educational Migration*, Springer Nature, Cham, Switzerland. pp. 427-439.

Aresi Giovanni, Moore Simon C, Marta Elena. (2021). The health behaviours of European study abroad students sampled from forty-two countries: Data from a three-wave longitudinal study. *Data in Brief* 38: 107285. doi: 10.1016/j.dib.2021.107285

Aresi Giovanni, Sorgente Angela, Moore Simon C, Marta Elena. (2021). Analysing change among study abroad students. A novel application of the person-centred approach to alcohol use patterns. *International Journal of Intercultural Relations* 82: 220-231. doi: 10.1016/j.ijintrel.2021.04.006

Banza Paula, Evans Darren M, Medeiros Mirra Renata, MacGregor Callum J, Belo Anabela D F. (2021). Short-term positive effects of wildfire

on diurnal insects and pollen transport in a Mediterranean ecosystem. *Ecological Entomology*. doi: 10.1111/een.13082

Bradley H, Dutta A, Philpott R. (2021). Presentation and non-surgical endodontic treatment of two patients with X-linked hypophosphatemia: a case report. *International Endodontic Journal* 54(8): 1403-1414. doi: 10.1111/iej.13520

Brown Helen, Clayton Aled, Stephens Phil. (2021). The role of bacterial extracellular vesicles in chronic wound infections: current knowledge and future challenges. *Wound Repair and Regeneration* 29(6): 864-880. doi: 10.1111/wrr.12949

Carey Elinor Claire, Gardiner Andrew Talbot Charles, Adams Robert John, Farnell Damian Joseph John, Claydon Nicholas Charles, Thomas David William. (2021). The effects of age and sex on mandibular bone graft donor sites. *Oral Surgery* 14(1): 52-58. doi: 10.1111/ORS.12535

Celiksoy Vildan, Moses Rachael L, Sloan Alastair J, Moseley Ryan, Heard Charles M. (2021). Synergistic in vitro antimicrobial activity of pomegranate rind extract and zinc (II) against *Micrococcus luteus* under planktonic and biofilm conditions. *Pharmaceutics* 13(6): 851. doi: 10.3390/pharmaceutics13060851

Chen Jieyi, Duangthip Duangporn, Gao Sherry Shiqian, Huang Fang, Anthonappa Robert, Oliveira Branca Heloisa, Turton Bathsheba, Durward Callum, El Tantawi Maha, Attia Dina, Heima Masahiro, Satta Muthu Murugan, Ayu Maharani Diah, Oluwatoyin Folayan Morenik, Phantumavanit Prathip, Sitthisettapong Thanya, Innes Nicola, Crystal Yasmi O, Ramos-Gomez Francisco, Medina Aida Carolina, Chin Man Lo Edward, Hung Chu Chun. (2021). Oral health policies to tackle the burden of early childhood caries: a review of 14 countries/regions. *Frontiers in Oral Health* 2: 670154. 10.3389/froh.2021.670154

Chen Shuo, Wu Wu, Li Qian-Hui, Xie Bu-Min, Shen Fan, Du Yu-Ping, Zong Zhi-Hong, Wang Li-Li, Wei Xiao-Qing, Zhao Yang. (2021). Circ-NOLC1 promotes epithelial ovarian cancer tumorigenesis and progression by binding ESRP1 and modulating CDK1 and RhoA expression. *Cell Death Discovery* 7(1): 22. doi: 10.1038/s41420-020-00381-0

Chiron Emilie, Varache Mathieu, Stokniene Joana, Thomas David W, Ferguson Elaine L. (2021). A physicochemical assessment of the thermal stability of dextrin–colistin conjugates. *Scientific Reports* 11(1): 10600. doi: 10.1038/s41598-021-89946-2

Crowe Hannah L, Woolley Stephen M. (2021). Dental students' experience of conscious sedation: A qualitative review of student reflections. *European Journal of Dental Education* (online ahead of print). doi: 10.1111/eje.12688

De-Deus G, Belladonna F G, Cavalcante D M, Simões Carvalho M, Silva E J N L, Carvalhal J C A, Zamolyi R Q, Lopes R T, Versiani M A, Dummer P M H, Zehnder M. (2021). Contrast enhanced micro CT to assess dental pulp tissue debridement in root canals of extracted teeth: a series of cascading experiments towards method validation. *International Endodontic Journal* 54(2): 279-293. doi: 10.1111/iej.13408

Dixon Jonathan, Manzaneres-Céspedes Cristina, Davies Julia, Vital Sibylle, Gerber Gabor, Paganelli Corrado, Akota Ilze, Murphy Denis, Quinn Barry, Roger-Leroi Valerie, Tubert-Jeannin Stephanie,

Field James. (2021). O-HEALTH-EDU: a scoping review on the reporting of oral health professional education in Europe. *European Journal of Dental Education* 25(1): 56-77. doi: 10.1111/eje.12577

Dixon Jonathan, Towers Ashley, Martin Nicolas, Field James. (2021). Re-defining the virtual reality dental simulator: demonstrating concurrent validity of clinically relevant assessment and feedback. *European Journal of Dental Education* 25(1): 108-116. doi: 10.1111/eje.12581

Duane Brett, Dixon Jonathan, Martin Nicolas, Giwa Ambibola, Aldana Clara, Coughlan James, Henao Daniel, Timus Daniela, Darragh Jáuregui Hogan, Ramasubbu Darshini, Perez Francisc, Schwendicke Falk, Correria Maria, Quinteros Maria, Van Harten Maria, Paganelli Corrado, Vos Peter, Lopez Rosa Moreno, Field James. (2021). Embedding environmental sustainability within the modern dental curriculum – Exploring current practice and developing a shared understanding. *European Journal of Dental Education* 25(3): 541-549. doi: 10.1111/eje.12631

Duncan H F, Nagendrababu V, El-Karim I, Dummer P M H. (2021). Outcome measures to assess the effectiveness of endodontic treatment for pulpitis and apical periodontitis for use in the development of European Society of Endodontology (ESE) S3 level clinical practice guidelines: a protocol. *International Endodontic Journal* 54(5): 646-654. doi: 10.1111/iej.13501

Krastl G, Weiger A, Filippi A, Van Waes H, Ebeleseder K, Ree M, Connert T, Widbiller M, Tjaderhane L, Dummer P M H, Galler K, (2021). European Society of Endodontology position statement: endodontic management of traumatized permanent teeth *International Endodontic Journal* 54(9) 1473-1481. doi: 10.1111/iej.13543

Farnell D J J, Richmond S, Galloway J, Zhurov A I, Pirttiniemi P, Heikkinen T, Harila V, Matthews H, Claes P. (2021). An exploration of adolescent facial shape changes with age via multilevel partial least squares regression. *Computer Methods and Programs in Biomedicine* 200: 105935. doi: 10.1016/j.cmpb.2021.105935

Field James, Dixon Jonathan, Towers Ashley, Green Rachel, Albagami Hathal, Lambourn Guy, Mallinson Julie, Fokkinga Wietske, Tricio-Pesce Jorge, Crnić Tin, Vital Sibylle. (2021). Defining dental operative skills curricula: an ADEE consensus paper. *European Journal of Dental Education* 25(2): 405-414. doi: 10.1111/eje.12595

Hanks Sally, Ranauta Amitha, Johnson Ilona, Bateman Heidi, Nasseripour Melanie, Neville Patricia (2021). Professionalism and dental education: in search of a shared understanding. *British Dental Journal* (in press).

Harrop E, Goss S, Farnell D, Longo M, Byrne A, Barawi K, Torrens-Burton A, Nelson A, Seddon K, Machin L, Sutton E, Roulston A, Finucane A, Penny A, Smith KV, Sivell S, Selman SE. (2021). Support needs and barriers to accessing support: Baseline results of a mixed-methods national survey of people bereaved during the COVID-19 pandemic. *Palliative Medicine* 35(10): 1985-1997. doi: 10.1177/02692163211043372

Harrop Emily, Selman Lucy, Farnell Damian, Byrne Anthony, Nelson Annmarie, Goss Silvia, Sutton Eileen, Seddon Kathy, Machin Linda, Penny Alison, Roulston Audrey, Carduff Emma, Finucane Anne, Smith Kirsten V, Torrens Burton Anna, Sivell Stephanie, Mayland Catriona, Wakefield Donna, Johnston Bridget, Longo Mirella. (2021). End of life and bereavement experiences during the COVID-19 pandemic: interim results from

a national survey of bereaved people. *BMJ Supportive and Palliative Care* 11(Supple A3). doi: 10.1136/spcare-2021-PCC.6

Heirene Robert, Roderique-Davies Gareth, John Bev, Moore Simon, Sakhuja Raman, Lewis Julia, Smith Josie. (2021). Draft support and treatment framework for prevention, diagnosis, treatment and support for alcohol-related brain damage [Welsh Government Consultation Document]

Herdman Mike, Johnson Ilona, Mason Stephen, Vernazza Christopher R, Varghese Roshan (2021). Development of a United Kingdom-centric cost-effectiveness model for denture cleaning strategies. *Journal of Prosthetic Dentistry* (in press). 10.1016/j.prosdent.2021.10.022

Hoskens Hanne, Liu Dongjing, Naqvi Sahin, Keun Lee Myoung, Eller Ryan J, Indencleef Karlijne, White Julie D, Li Jiarui, Larmuseau Maarten H D, Hens Greet, Wysocka Joanna, Walsh Susan, Richmond Stephen, Shriver Mark D, Shaffer John R, Peeters Hilde, Weinberg Seth M, Claes Peter. (2021). 3D facial phenotyping by biometric sibling matching used in contemporary genomic methodologies. *PLoS Genetics* 17(5): e1009528. doi: 10.1371/journal.pgen.1009528

Incladion Alexander, Boseley Megan, Moses Rachael L, Moseley Ryan, Hill Katja E, Thomas David W, Adams Rachel A, Jones Tim P, Berube Kelly A. (2021). A new look at the purported health benefits of commercial and natural clays. *Biomolecules* 11(1): 58. doi: 10.3390/biom11010058

Indencleef Karlijne, Hoskens Hanne, Lee Myoung Keun, White Julie D, Liu Chenxing, Eller Ryan J, Naqvi Sahin, Wehby George L, Uribe Lina M Moreno, Hecht Jacqueline T, Long Jr Ross E, Christensen Kaare, Deleyiannis Frederic W, Walsh Susan, Shriver Mark D, Richmond Stephen, Wysocka Joanna, Peeters Hilde, Shaffer John R, Marazita Mary L, Hens Greet, Weinberg Seth M, Claes Peter. (2021). The intersection of the genetic architectures of orofacial clefts and normal facial variation. *Frontiers in Genetics* 12: 626403. doi: 10.3389/fgene.2021.626403

Ishak Hayati, Field James, German Matthew. (2021). Baseline specimens of erosion and abrasion studies. *European Journal of Dentistry* 15(2): 369-378. doi: 10.1055/s-0040-1721235

Jakovljevic A, Slijivancanin Jakovljevic T, Duncan H F, Nagendrababu V, Jacimovic J, Aminoshariae A, Milasin J, Dummer P M H. (2021). The association between apical periodontitis and adverse pregnancy outcomes: a systematic review *International. Endodontic Journal* 54(9): 1527-1537. doi: 10.1111/iej.13538

Jayaraman Jayakumar, Dhar Vineet, Donly Kevin J, Priya Ekta, Raggio Daniela P, Childers Noel K, Wright Timothy J, Nagendrababu Venkateshbabu, Clarke Mike, King Nigel, Clarkson Jan, Innes Nicola PT, (2021). Reporting standards for research in Paediatric Dentistry (RAPID): an expert consensus-based statement. *BMC Oral Health* 21(1): 369. doi: 10.1186/s12903-021-01698-7

Jiao Yang, Brousseau Emmanuel, Nishio Ayre Wayne, Gait-Carr Edward, Shen Xiaojun, Wang Xiaoxiang, Bigot Samuel, Zhu Hanxing, He Weifeng. (2021). In vitro cytocompatibility of a Zr-based metallic glass modified by laser surface texturing for potential implant applications. *Applied Surface Science* 547. doi: 10.1016/j.apsusc.2021.149194

Johnson Ilona G, Jones Rhiannon J, Gallagher Jennifer E, Wade William G, Al-yaseen Waraf, Robertson Mark, McGregor Scott, C Sukriti K, Innes Nicola, Harris Rebecca. (2021). Dental periodontal procedures: a systematic review of contamination (splatter, droplets and aerosol) in relation to COVID-19. *BDJ Open* 7(1): 15. doi: 10.1038/s41405-021-00070-9

Krastl G, Weiger R, Filippi A, Van Waes H, Ebeleseder K, Ree M, Connert T, Widbiller M, Tjaderhane L, Dummer PMH, Galler K. (2021). Endodontic management of traumatized permanent teeth: a comprehensive review. *International Endodontic Journal* 54(8): 1221-1245. doi: 10.1111/iej.13508

Kok Zi Y, Alaidaroos Nadia YA, Alraies Amr, Colombo John S, Davies Lindsay C, Waddington Rachel J, Sloan Alastair J, Moseley Ryan. (2021). Dental pulp stem cell heterogeneity: finding superior quality 'needles' in a dental pulpal 'haystack' for regenerative medicine-based applications. *Stem Cells International* 2022: 9127074. doi: 10.1155/2022/9127074

Larrañaga-Altuna Mikel, Zabala Alaitz, Llavori Iñigo, Pearce Oliver, Nguyen Dinh T, Caro Jaume, Mescheder Holger, Endrino Jose L, Goel Gaurav, Nishio Ayre Wayne, Seenivasagam Rajkumar Kottayasamy, Tripathy Debendra Kumar, Armstrong Joe, Goel Saurav. (2021). Bactericidal surfaces: an emerging 21st century ultra-precision manufacturing and materials puzzle. *Applied Physics Reviews* 8(2): 021303. doi: 10.1063/5.0028844

Lee Angeline H C, Neelakantan Prasanna, Dummer Paul M H, Zhang Chengfei. (2021). Cemental tear: Literature review, proposed classification and recommendations for treatment. *International Endodontic Journal* 54(11): 2044-2073. doi: 10.1111/iej.13611

Li YaLing, Gao YaLi, Niu XueLi, Tang MingSui, Li JingYi, Song Bing, Guan XiuHao. (2021). LncRNA BASP1-AS1 interacts with YBX1 to regulate Notch transcription and drives the malignancy of melanoma. *Cancer Science* 112(11): 4526-4542. doi: 10.1111/cas.15140

Liu Chenzing, Lee Myoung Keun, Naqvi Sahin, Hoskens Hanne, Liu Dongjing, White Julie D, Indencleef Karlijne, Matthews Harold, Eller Ryan J, Li Jiarui, Mohammed Jaaved, Swigut Tomek, Richmond Stephen, Manyama Mange, Hallgrímsson Benedikt, Spritz Richard A, Feingold Eleanor, Marazita Mary L, Wysocka Joanna, Walsh Susan, Shriver Mark D, Claes Peter, Weinberg Seth M, Shaffer John R. (2021). Genome scans of facial features in East Africans and cross-population comparisons reveal novel associations. *PLoS Genetics* 17(8): e1009695. doi: 10.1371/journal.pgen.1009695

Liu Hong, Zhang Zhancheng, Zhou Shenli, Liu Xianfang, Li Guodong, Song Bing, Xu Wei. (2021). Claudin-1/4 as directly target gene of HIF-1 can feedback regulating HIF-1 by PI3K-AKT-mTOR and impact the proliferation of esophageal squamous cell though Rho GTPase and p-JNK pathway. *Cancer Gene Therapy* 2021. doi: 10.1038/s41417-021-00328-2

Luo Lin, Avery Steven J, Waddington Rachel J. (2021). Exploring a chemotactic role for EVs from progenitor cell populations of human exfoliated deciduous teeth for promoting migration of naïve BMSCs in bone repair process. *Stem Cells International* 2021: 6681771. doi: 10.1155/2021/6681771

Mark Erwin P, Lewis Michael AO, Graziani Filippo, Atlas Boris, Utsch Joern. (2021).

Droplet sizes emitted from demonstration electric toothbrushes. *International Journal of Environmental Research and Public Health* 18(5): 2320. doi: 10.3390/ijerph18052320

Marshman Zoe, El-Yousfi Sarab, Kellar Ian, Dey Donna, Robertson Mark, Day Peter, Chestnutt Ivor, Pavitt Sue, de Araujo Mariana, Innes Nicola. (2021). Development of a secondary school-based digital behaviour change intervention to improve tooth brushing. *BMC Oral Health* 21(1): 546. doi: 10.1186/s12903-021-01907-3

Masello Juan, Barbosa Andres, Kato Akiko, Mattern Thomas, Medeiros Mirra Renata, Stockdale Jennifer, Kümmel Marc N, Bustamante Paco, Belliure Josabel, Benzal Jesús, Colominas-Ciuró Roger, Menéndez-Blázquez Javier. (2021). How animals distribute themselves in space: energy landscapes of Antarctic avian predators. *Movement Ecology* 9: 24. doi: 10.1186/s40462-021-00255-9

Mohd Nor Nor Azlida, Chadwick Barbara L, Farnell Damian J J, Chestnutt Ivor G. (2021). Factors associated with dental fluorosis amongst Malaysian children exposed to different fluoride concentrations in the public water supply. *Journal of Public Health Dentistry* 81(4): 270-279. doi: 10.1111/jphd.12448

Mok Zi Hong, Mylonas Petros, Austin Rupert, Proctor Gordon, Pitts Nigel, Thanou Maya. (2021). Calcium phosphate nanoparticles for potential application as enamel remineralising agent tested on hydroxyapatite discs. *Nanoscale* 13: 20002-20012. 10.1039/d1nr05378g

Monecke Stefan, Muller Elke, Braun Sascha D, Armengol-Porta Marc, Bes Michele, Boswihi Samar, El-Ashker Maged, Engelmann Ines, Gawlik Darius, Gwida Mayada, Hotzel Helmut, Nassar Rania, Reissig Annett, Ruppelt-Lorz Antje, Senok Abiola, Simily Ali M, Udo Edet E, Ehrlich Ralf. (2021). Characterisation of *S. aureus*/MRSA CC1153 and review of mobile genetic elements carrying the fusidic acid resistance gene *fusC*. *Scientific Reports* 11(1): 8128. doi: 10.1038/s41598-021-86273-4

Moore Simon C, Young Tracey, Irving Andy, Goodacre Steve, Brennan Alan, Amos Yvette. (2021). Controlled observational study and economic evaluation of the effect of city-centre night-time alcohol intoxication management services on the emergency care system compared to usual care. *Emergency Medicine Journal* 38(7): 504-510. doi: 10.1136/emmed-2019-209273

Moore Simon, Orpen Bella, Smith Jesse, Sarkar Chinmoy, Chenlu Li, Shepherd Jonathan, Bauermeister Sarah. (2021). Alcohol affordability: implications for alcohol price policies. A cross-sectional analysis in middle and older adults from UK Biobank. *Journal of Public Health* (online ahead of print). doi: 10.1093/pubmed/fdab095

Moseley Ryan, Waddington Rachel J. (2021). Modification of gingival proteoglycans by reactive oxygen species: potential mechanism of proteoglycan degradation during periodontal diseases. *Free Radical Research* (online ahead of print). doi: 10.1080/10715762.2021.2003351

Mylonas P, Moazzez R, Joiner A, Bartlett D, Bull T, McBride J. (2021). Surface form analysis on complex freeform organic structures – measuring erosive wear on human teeth in vitro. *Surface Topography: Metrology and Properties* 9: 025024. doi: 10.1088/2051-672X/abfd07

Mylonas Petros, Zhang Jing, Banerjee Avijit. (2021). Conventional glass-ionomer cements – a guide for practitioners. Dental Update 48(8): 643-650. doi: 10.12968/denu.2021.48.8.643

Nagendrababu V, Abbott P, Duncan H F, Fouad A F, Kruse C, Patel S, Pigg M, Rechenberg D K, Dummer P M H. (2021). Preferred Reporting Items for Diagnostic Accuracy Studies in Endodontics (PRIDASE) guidelines: a development protocol. International Endodontic Journal 54(7): 1051-1055. doi: 10.1111/iej.13497

Nagendrababu V, Abbott PV, Pulikkotil SJ, Veettil SK, Dummer PMH. (2021). Comparing the anaesthetic efficacy of 1.8 mL and 3.6 mL of anaesthetic solution for inferior alveolar nerve blocks for teeth with irreversible pulpitis: a systematic review and meta-analysis with trial sequential analysis. International Endodontic Journal 54(3): 331-342. doi: 10.1111/iej.13428

Nagendrababu V, Duncan HF, Pulikkotil SJ, Dummer PMH. (2021). Glossary for randomized clinical trials. International Endodontic Journal 54(3): 354-365. doi: 10.1111/iej.13434

Nagendrababu V, Jakovljevic A, Jacimovic J, Duncan H F, Jayaraman J, Dummer P M H. (2021). Critical analysis of the reporting quality of randomized trials within endodontics using the Preferred Reporting Items for RAnimized Trials in Endodontics (PRIRATE) 2020 quality standard checklist. International Endodontic Journal 54(7): 1083-1104. doi: 10.1111/iej.13489

Nagendrababu V, Kishen A, Murray P E, Nekoofar M H, de Figueiredo J A P, Priya E, Jayaraman J, Pulikkotil S J, Camilleri J, Silva R M, Dummer P M H. (2021). PRIASE 2021 guidelines for reporting animal studies in Endodontology: a consensus based development. International Endodontic Journal 54(6): 848-857. doi: 10.1111/iej.13477

Nagendrababu V, Kishen A, Murray P E, Nekoofar M H, de Figueiredo J A P, Priya E, Jayaraman J, Pulikkotil S J, Jakovljevic A, Dummer P M H. (2021). PRIASE 2021. guidelines for reporting animal studies in endodontology: explanation and elaboration. International Endodontic Journal 54(6): 858-886. doi: 10.1111/iej.13481

Nagendrababu Venkateshbabu, Murray Peter E, Ordinola-Zapata Ronald, Peters Ove A, Rôças Isabela Neves, Siqueira Jr Jose F, Priya Ekta, Jayaraman Jayakumar, Pulikkotil Shaju J, Camilleri Josette, Boutsioukis Christos, Rossi-Fedeles Giampero, Dummer Paul M H. (2021). PRILE 2021 guidelines for reporting laboratory studies in Endodontology: A consensus-based development. International Endodontic Journal 54(9): 1482-1490. doi: 10.1111/iej.13542

Nagendrababu Venkateshbabu, Jacimovic Jelena, Jakovljevic Aleksandar, Rossi-Fedeles Giampero, Dummer Paul MH. (2021). A bibliometric analysis of the top 100 most-cited case reports and case series in Endodontic journals. International Endodontic Journal (online ahead of print). doi: 10.1111/iej.13668

Naqvi Sahin, Sley P Yoeri, Hoskens Hanne, Indencleef Karlijne, Spence Jeffrey P, Bruffaerts Rose, Radwan Ahmed, Eller Ryan J, Richmond Stephen, Shriver Mark D, Shaffer John R, Weinberg Seth M, Walsh Susan, Thompson James, Pritchard Jonathan K, Sunaert Stefan, Peeters Hilde, Wysocka Joanna, Claes Peter. (2021). Shared heritability of human face and brain shape. Nature Genetics 53: 830-839. doi: 10.1038/s41588-021-00827-w

Nash Julie, Woolley Stephen. (2021). Managing patients with developmental co-ordination disorder in dentistry: Developing an online resource for dental professionals by a review of the literature. Special Care in Dentistry (online ahead of print). 10.1111/scd.12661

Nassar Mohannad, Nassar Rania, Maki Hussain, Al-Yagoob Abdullah, Hachim Mahmood Y, Senok Abiola, Williams David, Hiraishi Noriko. (2021). Phytic acid: properties and potential applications in dentistry. Frontiers in Materials 8: 638909 . doi: 10.3389/fmats.2021.638909

Nassar Rania, Hachim Mahmood Yaseen, Nassar Mohannad, Kaklamanos Eleftherios G, Jamal Mohamed, Williams David, Senok Abiola. (2021). Microbial metabolic genes crucial for S. aureus biofilms: an insight from re-analysis of publicly available microarray datasets. Frontiers in Microbiology 11: 607002. doi: 10.3389/fmicb.2020.607002

Nassar Rania, Nassar Mohannad, Vianna Morgana, Naidoo Nerissa, Alqutami Fatma, Kaklamanos Eleftherios G, Senok Abiola, Williams David. (2021). Antimicrobial activity of phytic acid: an emerging agent in dentistry. Frontiers in Cellular and Infection Microbiology 11: 753649. doi: 10.3389/fcimb.2021.753649

Nishio Ayre Wayne, Scully Nicole, Elford Carole, Evans Bronwen AJ, Rowe Wendy, Rowlands Jeff, Mitha Ravi, Malpas Paul, Manti Panagiota, Holt Cathy, Morgan-Jones Rhidian, Birchall James, Denyer Stephen P, Evans Sam L. (2021). Alternative radiopacifiers for polymethyl methacrylate bone cements: Silane-treated anatase titanium dioxide and yttria-stabilised zirconium dioxide. Journal of Biomaterials Applications 35(10): 1235-1252. doi: 10.1177/0885328220983797

Nosrat Ali, Bolhari Behnam, Saber Tahan Shima, Dianet Omid, Dummer Paul Michael Howell. (2021). Revitalizing previously treated teeth with open apices: a case report and a literature review. International Endodontic Journal 54(10): 1782-1793. doi: 10.1111/iej.13570

Oakley Juliette L, Weiser Rebecca, Powell Lydia C, Forton Julian, Mahenthiralingam Eshwar, Rye Philip D, Hill Katja E, Thomas David W, Pritchard Manon F. (2021). Phenotypic and genotypic adaptations in Pseudomonas aeruginosa biofilms following long-term exposure to an alginate oligomer therapy. mSphere 6(1): e01216-20. doi: 10.1128/mSphere.01216-20

Olley R C, Renton T F, Frost P M. (2021). 15-year unique observational study of intraligamentary local anaesthesia for posterior mandibular extractions. British Dental Journal (online ahead of print). doi: 10.1038/s41415-020-2350-8

Olsen M, Nassar R, Senok A, Albastaki A, Leggett J, Lohning A, Campos M, Jones P, McKirdy S, Tajouri L, Alghafri R. (2021). A pilot metagenomic study reveals that community derived mobile phones are reservoirs of viable pathogenic microbes. Scientific Reports 11: 14102. doi: 10.1038/s41598-021-93622-w

Perry John, Popat Hashmat, Johnson Ilona, Farnell Damian, Morgan Maria Z. (2021). Professional consensus on orthodontic risks - what orthodontists should tell their patients. American Journal of Orthodontics and Dentofacial Orthopedics 159(1): 41-52. doi: 10.1016/j.jado.2019.11.017

Pigg Maria, Duncan Henry F, Nagendrababu Venkateshbabu, Abbott Paul, Fouad Ashraf F, Kruse Casper, Patel Shanon, Rechenberg Dan Krister, Dummer Paul M H. (2021). Preferred Reporting Items for Diagnostic Accuracy Studies in Endodontics (PRIDASE): Guidance to improve manuscripts assessing the diagnostic accuracy of procedures, techniques and devices. International Endodontic Journal 54(7): 1005-1007. doi: 10.1111/iej.13539

Powell Lydia C, Abdulkarim Muthanna, Stokniene Joana, Yang Qui E, Walsh Timothy R, Hill Katja E, Gumbleton Mark, Thomas David W. (2021). Quantifying the effects of antibiotic treatment on the extracellular polymer network of antimicrobial resistant and sensitive biofilms using multiple particle tracking. npj Biofilms and Microbiomes 7(1): 13. doi: 10.1038/s41522-020-00172-6

Schulze-Krebs Anja, Canneva Fabio, Stemick Judith, Plank Anne-Christine, Harrer Julia, Bates Gillian P, Aeschlimann Daniel, Steffan Joan S, von Hörsten Stephan. (2021). Transglutaminase 6 is colocalized and interacts with mutant Huntingtin in Huntington disease rodent animal models. International Journal of Molecular Sciences 22(16): 8914. doi: 10.3390/ijms22168914

Schwendicke F, Walsh T, Lamont T, Al-yaseen W, Bjørndal L, Clarkson JE, Fontana M, Gomez Rossi J, Göstemeyer G, Levey C, Müller A, Ricketts D, Robertson M, Santamaria RM, Innes NPT. (2021). Interventions for treating cavitated or dentine carious lesions (Review). Cochrane Database of Systematic Reviews 7(7): CD013039. doi: 10.1002/14651858.CD013039.pub2.

Scott H, Cope A L, Wood F, Joseph-Williams N, Kakri A, Roberts E, Lovell-Smith C, Chestnutt I G. (2021). A qualitative exploration of decisions about dental recall intervals. Part 2: perspectives of dentists and patients on the role of shared decision making in dental recall decisions. British Dental Journal (in press)

Scott H, Cope A L, Wood F, Joseph-Williams N, Karki A, Roberts E, Lovell-Smith C, Chestnutt I G. (2021). A qualitative exploration of decisions about dental recall intervals. Part 1: attitudes of NHS general dental practitioners to NICE Guideline (CG19) on the interval between oral health reviews. British Dental Journal (in press)

Seifo N, Cassie H, Radford J R, Innes N T P. (2021). "I guess it looks worse to me, it doesn't look like there's been a problem solved but obviously there is": A qualitative exploration of children's and their parents' views of silver diamine fluoride for the management of carious lesions in children. BMC Oral Health 21(1): 367. doi: 10.1186/s12903-021-01730-w

Senok Abiola, Alfaresi Mubarak, Khansaheb Hamda, Nassar Rania, Hachim Mahmood, Al Suwaidi Hanan, Almansoori Majed, Alqaydi Fatma, Afaneh Zuhair, Mohamed Aayla, Qureshi Shahab, Ali Ayman, Alkhajeh Abdulmajeed, Alsheikh-Ali Alawi. (2021). Coinfections in patients hospitalized with COVID-19: a descriptive study from the United Arab Emirates. Infection and Drug Resistance 14: 2289-2296. doi: 10.2147/IDR.S314029

Senok Abiola, Monecke Stefan, Nassar Rania, Celiloglu Handan, Thyagarajan Sreeraj, Muller Elke, Ehricht Ralf. (2021). Lateral flow immunoassay for the Detection of Panton-Valentine leukocidin in Staphylococcus aureus from skin and soft tissue infections in the United Arab Emirates. Frontiers in Cellular and Infection Microbiology 11: 754523. 10.3389/fcimb.2021.754523

Shepherd Jonathan P, Moore Simon C, Long

Walsh Susan, Weinberg Seth M, Shriver Mark D, Claes Peter. (2021). Insights into the genetic architecture of the human face. Nature Genetics 53: 45-53. doi: 10.1038/s41588-020-00741-7

Williams Ailish, Rogers Helen, Williams David, Wei Xiao-Qing, Farnell Damian, Wozniak Sue, Jones Adam. (2021). Higher number of EB13 cells in mucosal chronic hyperplastic candidiasis may serve to regulate IL-17 producing cells. Journal of Fungi 7(7): 533. doi: 10.3390/jof7070533

Woolley Stephen, Lau Winto. (2021). Ten years on: an online questionnaire evaluation of the UK special care dentistry specialist workforce British Dental Journal (online ahead of print). doi: 10.1038/s41415-021-2946-7

Abigail, Mercer Kollar Laura M, Sumner Steven A. (2021). Association between COVID-19 lockdown measures and emergency department visits for violence-related injuries in Cardiff, Wales. Journal of the American Medical Association 325(9): 885-887. doi: 10.1001/jama.2020.25511

Sivarajasingam Vaseekaran, Guan Bo, Page Nicholas, Moore Simon, Shepherd Jonathan. (2021). Violence in England and Wales in 2020: an accident and emergency perspective. Cardiff: Crime and Security Research Institute, Cardiff University.

Song Bing, Gu Yu, Jiang Wenkai, Li Ying, Nishio Ayre Wayne, Liu Zhipeng, Yin Tao, Janetopolous Christopher, Iijima Miho, Devreotes Peter, Zhao Min. (2021). Electric signals counterbalanced posterior vs anterior PTEN signaling in directed migration of Dictyostelium. Cell and Bioscience 11(1): 111. doi: 10.1186/s13578-021-00580-x

Stephens Neil, Stephens Phil. (2021). Interdisciplinary projects as an expert-network: analysing team work across biological and physical sciences. Science and Technology Studies 34(4): 56-73. doi: 10.23987/sts.87339

Tai Yifan, Woods Emma L, Dally Jordanna, Kong Deling, Steadman Robert, Moseley Ryan, Midgley Adam C. (2021). Myofibroblasts: function, formation, and scope of molecular therapies for skin fibrosis. Biomolecules 11(8): 1095. doi: 10.3390/biom11081095

Towers Ashley, Dixon Jonathan, Field James, Martin Rachel, Martin Nicolas. (2021). Combining virtual reality and 3D printed models to simulate patient-specific dental operative procedures - a study exploring student perceptions European Journal of Dental Education (online ahead of print). doi: 10.1111/eje.12715

Trefan Laszlo, Akbari Ashley, Morgan Jennifer Sian, Farewell Daniel Mark, Fone David, Lyons Ronan A, Jones Hywel Merfyn, Moore Simon C. (2021). Visualisation and optimisation of alcohol-related hospital admission ICD-10 codes in Welsh e-cohort data International. Journal of Population Data Science 6(1): 1373. doi: 10.23889/ijpds.v6i1.1373

Uribe Sergio E, Innes Nicola, Maldupa Ilze. (2021). The global prevalence of early childhood caries: a systematic review with meta-analysis using the WHO diagnostic criteria. International Journal of Paediatric Dentistry 31(6): 817-830. doi: 10.1111/ipd.12783

Vanhatalo Anni, L'Heureux Joanna E, Kelly James, Blackwell Jamie R, Wylie Lee J, Fulford Jonathan, Winyard Paul G, Williams David W, van der Giezen Mark, Jones Andrew M. (2021). Network analysis of nitrate-sensitive oral microbiome reveals interactions with cognitive function and cardiovascular health across dietary interventions. Redox Biology 41: 101933. doi: 10.1016/j.redox.2021.101933

Wang Diya, Sun Shukai, Xue Ying, Qui Jun, Ye Tao, Zhang Rong, Song Bing, He Wenxi, Zhang Yaqing, Jiang Wenkai. (2021). MicroRNA-223 negatively regulates LPS-induced inflammatory responses by targeting NLRP3 in human dental pulp fibroblasts. International Endodontic Journal 54(2): 241-254. doi: 10.1111/iej.13413

White Julie D, Indencleef Karlijne, Naqvi Sahin, Eller Ryan J, Hoskens Hanne, Roosenboom Jasmien, Lee Myoung Keun, Li Jiarui, Mohammed Jaaved, Richmond Stephen, Quillen Ellen E, Norton Heather L, Feingold Eleanor, Swigut Tomek, Marazita Mary L, Peeters Hilde, Hens Greet, Shaffer John R, Wysocka Joanna,



School of Dentistry
Ysgol Deintyddiaeth

School of Dentistry
University Dental Hospital
Heath Park
Cardiff
CF14 4XY
dentalhos@cardiff.ac.uk
+44 (0)29 2074 2470

The only dental school in Wales,
providing **unique and important**
leadership in dental research,
teaching and patient care.