From Newcastle. For the world.
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I am very proud of our research at Newcastle because it crosses both translational research gaps; we make discoveries and translate them into new therapies and we identify the effectiveness of care and therapies and translate this into everyday practice. We then use our research findings to shape and influence policy.

All of our research findings flow into high quality research-led and research informed education and engagement with the wider dental community, patients, the public, industry, other stakeholders and policy-makers. We have a strong track record of seeing through multiple stages of research to ensure the eventual output really matters rather than just being of academic interest. All of our research typifies this approach but especially our research in dental education where we try to answer some of the more difficult contemporary questions in clinical education.

Another key area that gives the School and I great pleasure is our ability to mentor and supervise early career researchers from across the undergraduate and postgraduate spectrum. We take great pride in our excellent track record in nurturing and developing our early career researchers whether it be for a vacation (summer) project as an undergraduate, an intercalated Masters of Research, or a scholarship or fellowship funded PhD. Our success in developing others’ academic careers, as well as our ability to collaborate constructively is illustrated by an international web of collaborators shown on the map on page 6/7.

The School is always actively looking to work with others in areas of common interest so please don’t hesitate to get in touch with us and we will always do our best to see if we can help.

Prof Justin Durham,
Justin.Durham@newcastle.ac.uk
We use our expertise to generate high quality, impactful research to improve oral health care and dental education.
I hope this booklet will give you a helpful introduction to the research we do here at Newcastle University School of Dental Sciences where our mission is to conduct world-class multidisciplinary research which improves oral health through academic excellence, policy impact and commercial innovation.

Our research is focussed around three core areas of Translational Oral Biosciences, Oral Health Care and Epidemiology, and Dental Education which are all described in the following pages. In addition, our diverse and vibrant community of postgraduate students, researchers, clinical academic trainees, professional support staff and academic staff as well as our world class facilities to match are described in the later pages. I hope you enjoy discovering more about what we do and we look forward to hearing from you if you would like any more details about any of our research activity or to discuss our opportunities.

Dr Chris Vernazza,
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We work with leading scientists across the globe in some of the most important aspects of oral health research.

This map shows many of our current international collaborations.
From Newcastle. For the world.
What we work on
In oral microbiology we investigate novel approaches to control microbial biofilms. Oral immunology explores the pathogenesis of periodontal diseases and identifies potential biomarkers. Research into oral cancer investigates molecular markers for early diagnosis, characterisation of their biological function and the role of HPV. We study the roles of microRNAs and genetic polymorphisms in oral mucosal inflammatory disorders such as oral lichen planus.

Our research on persistent orofacial pain develops neuronal cell models to study the function of ion channels and the relationship between neuronal hyperexcitability and pain symptoms. In dental materials research we develop new bioactive, anti-microbial polymer composites.

Who we collaborate with
We work with engineers, computer scientists, mathematicians, bioinformaticians, pharmacists, parasitologists and colleagues from a wide range of other disciplines at Newcastle University. We have a global network of collaborations from the US to Sweden, Finland, Brazil, Australia, Japan, China, Malaysia, Singapore and many others.
Some recent projects we’ve done

• Control of oral biofilms using a natural marine microbial enzyme, funded by IADR Innovation in Oral Care Award, lead Nick Jakubovics

• Development of a novel biosensor for the detection of salivary matrix metalloproteinase 8 in periodontal diseases, funded by EPSRC & Innovate UK Project Grant, lead John Taylor

• Evaluation of the prognostic potential and functional significance of two novel biomarkers in oral cancer, funded by The Pathological Society & Newcastle Healthcare Charity, lead Ralf Kist

• STOP-TRANSIT: Peri-procedural targets in toothache to stop transition to phantom neuropathic tooth pain, funded by NIHR Biomedical Research Centre, lead Jamie Coulter

What impact we’ve had

We have developed novel enzymes and agents for biofilm control that are progressing through the translational pipeline. Our biomarker research has identified novel biomarker signatures associated with periodontitis and the development of oral cancer that are the subject of patent applications. Our group has a strong track record in successfully training PhD students, including many international students from around the world.
What was the project about?
Current diagnostic approaches for periodontitis are time-consuming and require interpretation of multiple aspects of clinical and radiographic assessment. Chair-side monitoring of inflammatory mediators of periodontitis could provide immediate information about disease activity, which can inform patient management. We aimed to develop a biosensor combining the accuracy and flexibility of antibodies in detecting individual proteins in biological fluids with novel nanotechnology which facilitates transduction of fluid phase molecular events into rapid electronic readouts.

What did you do?
We used ‘biochips’ comprising antibody coated gold and quartz piezoelectric microchips. Upon antibody detection of the specific salivary protein, surface condition changes prompt analogue signals detected by the biochip electrodes. We identified optimal conditions for the operation of these laboratory prototypes biosensor and defined the sensitivity and reproducibility of its measurements. We compared its performance against the ‘gold standard’ assays (enzyme linked immunosorbent assays, ELISAs) in measuring mediators in saliva from patients with periodontal diseases.
What did you find?

We could develop sensors to detect matrix metalloproteinase-8 (MMP-8) and interleukin-1β (IL-1β) which are both important mediators of inflammation in periodontitis. Both sensors provided analytical performance comparable to ELISA assays. Detailed investigation of the MMP-8 sensor yielded measurements of salivary MMP-8 levels which correlated with clinical measurements of periodontitis (e.g. probing depth etc.), could distinguish patients with gingivitis and periodontitis from one-another and from volunteers who were periodontally healthy as well as mirroring clinical changes longitudinally throughout treatment. Real-time measurements using our biosensor took 10 minutes to complete which is within time-frame for clinical use.

What difference will this make?

We have shown this novel technology can provide clinically useful data which can be obtained rapidly in real-time. In addition to use in the dental clinic, this approach may be of use in supporting patients and carers for example in the home, in care-homes or even in remote regions without access to dental clinical facilities. This will be particularly important given the high prevalence of periodontitis in an ageing population and the increasing recognition of the clinical relationship between periodontitis and conditions such as diabetes and cardiovascular disease.
What we work on

Our globally-recognised multidisciplinary research ranges from multicentre clinical trials, to the design and conduct of national epidemiological surveys of oral health. Our skills in conducting mixed methods research and across the life course, strengthens our abilities to answer key research priorities and questions. Together with our growing expertise in oral health economics, nutrition and public health, our research contributes to the evidence-base that underpins evolving health policy to improve the health and wellbeing of patients and populations. Our research in periodontal diseases and orofacial pain build upon the basic sciences through clinical research and interventions for improved patient outcomes.

Who we collaborate with

We work with health economists, epidemiologists, psychologists, sociologists, clinical trialists and statisticians at Newcastle University. We also link with other universities including at Birmingham, Cork, Dundee, Liverpool, University College London, in the UK and Radboud University, Malmo University, University of Minnesota, University of California, University of Melbourne, University of Pittsburgh, University of Otago, University of Sao Paulo and the University of Washington as well as commercial and policy partners.
Some recent projects we've done

- Filling Children’s Teeth: Indicated Or Not? (FiCTION), funded by NIHR, lead Anne Maguire
- Resource allocation in NHS dentistry: Recognition of societal preference (RAINDROP), funded by NIHR, lead Chris Vernazza
- Oral nutritional interventions in malnourished frail elderly, funded by NIHR, lead Sheena Ramsay
- Development of oral health initiatives to improve glycaemic control, funded by NIHR, lead Susan Bissett
- Investigating Problem Orientated Patient Pathways (patients with dental pain), funded by NIHR, lead Charlotte Currie
- In-vitro comparison of the marginal adaption between a 3M direct crown and a pressed lithium disilicate crown, funded by 3M, lead Chris O’Connor

What impact we’ve had

Studies involving FiCTION, RAINDROP, the decennial Adult and Children’s Dental Health Surveys, the oral health of older people and emergency hospital attendance by patients experiencing dental pain have been acknowledged by commissioning, policy and professional organisations including NHS England, Public Health England and the British Dental Association and are changing policy and clinical practice across the world.
Evaluation of electronic cigarettes for smoking cessation in patients with periodontitis

Lead: Dr Richard Holliday
Funder: National Institute for Health Research

CASE STUDY:

What was the project about?
Smoking cessation interventions play an important role in dental care, especially for patients with periodontitis. Novel nicotine products, such as electronic cigarettes (e-cigarettes), have recently become popular with smokers and can be used to quit or reduce tobacco smoking. This project aimed to explore the behavioural and biological changes that occur when smokers with periodontitis are provided with an e-cigarette.

What did you do?
This research had three components. Firstly, a systematic review investigated the in vitro effects of nicotine on periodontal cells. Secondly, a 6-month pilot randomised controlled trial (RCT) was conducted of an e-cigarette smoking cessation intervention in smokers with periodontitis. Outcome measures were collected on both smoking status and oral health. The main focus was on feasibility, including recruitment and retention rates. Thirdly, theory-based qualitative interviews investigated patient perceptions about smoking, dental smoking cessation interventions and e-cigarettes.
What did you find?
The systematic review concluded that nicotine, at physiological concentrations, was not cytotoxic to periodontal cells in vitro but may have effects on other cell functions. In the pilot RCT, participant retention was 73% at 6 months. The e-cigarette intervention was well received with 90% using an e-cigarette at the quit date. 20% of participants in the control group used an e-cigarette, against instructions. Outcome measures were successfully completed. A weekly smoking questionnaire had poor completion rates. Patients perceived dentist-delivered smoking cessation advice positively. General perceptions of e-cigarettes were mixed and influenced by personal experience, other users, addiction concerns, health concerns and social acceptability. In summary, providing and studying an e-cigarette intervention within the dental setting was feasible and well accepted by patients.

What difference will this make?
This work will inform the design of a definitive RCT evaluating the role (and oral health effects) of an e-cigarette intervention delivered in dental settings. The work will also inform future methodology in biological studies of vaping as well informing the design of future interventions around smoking in the dental context.

What do you plan to do next?
We plan to evaluate dental professionals delivering ‘enhanced’ smoking cessation interventions, including the provision of nicotine replacement therapy and e-cigarettes. This definitive study will be best conducted in primary dental care and across multiple centres. We are currently applying for funding to support this important project.
Dental Education

Lead Heidi Bateman
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What we work on
The research conducted in dental education aims to inform the development, enhancement and delivery of high quality education for dental health care professionals. We have members researching a wide range of aspects associated with dental education and a number of areas of specific interest:

- The individual learner and teacher: learner wellbeing, peer learning, team working, improving and assessing professional qualities and educational transitions
- Development of the curriculum: integration, theory, development, delivery and assessment
- Wider views: Internationalisation, patient involvement in assessment, feedback and selection

Who we collaborate with
Within Newcastle University we have strong links with the Business School, School of Psychology and the School of Medical Education. We also work with colleagues at Cardiff University, Glasgow University, Sheffield University, Indiana University as well as Health Education England
Some recent projects we’ve done
• Obtaining patient feedback for quality assurance of undergraduate dental teaching, lead Zoë Freeman
• Understanding the background to the GDC learning outcomes for undergraduate dental programmes, lead Helen Mather
• Educating Dental Educators to do Education Research, leads Luisa Wakeling & Janice Ellis
• Professionalism as explored through regulatory documentation, lead Heidi Bateman
• What are the benefits of a UK-USA educational initiative and visit programme for dental students? leads Richard Holmes & Paula Waterhouse

What impact we’ve had
The key outcome for our research is better education of dental health care professionals. What we do feeds back into teaching and curriculum development at Newcastle and beyond. Our members have led a workshop at an international dental education conference leading to a toolkit to be hosted by ADEE, intended for early career educational researchers. We hosted a UK symposium on Dental Education Research. This led to the formation of the British Alliance for Researchers in Dental Education and Scholarship (BARDES), which has grown in membership and now holds an annual conference.
Professional Learning through Student Representation

Lead: Dr Luisa Wakeling
Funder: Faculty Education Research Development and Practice Unit and University Innovation Fund

What was the project about?
Newcastle University’s Academic Representation System enables students to represent their peers and provide feedback on their learning experience. Many of the skills that students develop as Representatives echo expected professional skills needed for their future career (e.g. dealing with complaints, raising concern, effective management and leadership). We aimed to investigate the professional learning that students develop as Representatives and develop training to help foster the development and recognition of that learning.

What did you do?
In collaboration with student interns, the learning that takes place by students in their Representation duties was investigated using qualitative research methods. The Professional Learning through Representation programme was then co-designed with student interns, dental professionals and Newcastle University’s Students’ Union (NUSU) Representation department to provide students with an opportunity to build on their Academic Representation experience and develop related professional skills. Contribution from a dental professional provided information on opportunities for representation after graduation.

CASE STUDY:
What did you find?
Themes derived from data collected in Student Representative focus groups were ‘Personal Skills’, ‘Experiences’ and ‘Opportunity’. These were used to build workshop content where professional skills were aligned to student experiences. Professional skills such as maintaining and protecting information and working with colleagues were aligned to actual experiences of Student Representatives.

What difference will this make?
Workshop evaluation relayed students’ further understanding of dental school and University processes and how skills developed in Representation would be beneficial to their career. We anticipate that student recognition of these skills and highlighting opportunities in Representation in Dentistry will encourage those with these skills to take up positions of professional representation after graduation. The workshop will provide students with a NUSU Award.

What do you plan to do next?
We hope to continue running the workshops in the Dental School to enhance the skills of our Student Representatives. The workshops have also been adapted to other professions and are currently being run in the Law programme here at Newcastle University.
Opportunities for study

With our international reputation and excellent research facilities, we are well placed to offer postgraduate research opportunities of the highest standard. As a postgraduate research student studying for a Dental Sciences MPhil or PhD, you will be based within a Research Institute in the Faculty of Medical Sciences. The programme is delivered in the School of Dental Sciences where you will work within research teams led by experts in their field in a friendly and supportive environment. We offer research projects in three key areas: Translational Oral Biosciences, Oral Health Care & Epidemiology and Dental Education. Further details on the research in each of the areas can be found earlier in this booklet.

The research student community

We are proud of our rich and diverse research community, including UK, EU and international students engaged in a wide range of research projects. This is reflected by our varied research seminar programme to which invited external speakers, School- and Faculty-based researchers and all postgraduate students contribute.
Training environment

Our postgraduate students benefit from a comprehensive research skills training programme including hands-on training in laboratory techniques and a range of workshops on health and safety, research methods and ethics, IT skills, and academic presentations/writing. English language support, academic mentoring and career advice is also available.

Funding

Our dedicated postgraduate funding website lists all funding sources in one place. We support applications to University scholarship schemes as well as applications to external funding bodies such as the NIHR or international organisations.

How to apply

To apply, please use Newcastle University’s online application portal. Further information and a step-by-step guide are available here:
What are you studying?
My PhD study investigates and evaluates oral health assessment measures that can be used to guide oral care planning for dependent adults. This has been done by conducting two systematic reviews and undertaking qualitative interviews with health service providers of dependent adults.

Why did you choose Newcastle?
I was looking forward to completing my postgraduate study at the Newcastle School of Dental Sciences because of its elite reputation and for being amongst the highest-ranked schools in the field of dentistry. I believed that being a part of this school’s academic leadership and scientific innovation would help me to accomplish my objectives.

What is it like studying at Newcastle?
While studying a PhD is always challenging, the continuous support I have received from the university’s staff helped me to overcome many obstacles during my study. I am especially glad for the excellent support from my supervisors. In addition, the Skills Development Programme offered by the School helped me to improve my research skills.

What do you hope to do after your PhD?
I will go back to my home country, Saudi Arabia, to resume my role as a faculty member at the KSAU-HS College of Dentistry. My goal is to take part in educating a new generation of dentists who are competent to practise dentistry at the highest standards. I would also like to continuously contribute to the scientific field by making ongoing research a part of my career.
Chris Dowson

What are you studying?
I’m currently working towards obtaining a PhD in oral immunology. The aim of my project is to validate a candidate biomarker for periodontitis.

Why did you choose Newcastle?
I chose Newcastle because of the excellent facilities and equipment available for researchers in biological sciences and also due to Newcastle’s reputation as an institute committed to research. Newcastle is also an excellent place to network and collaborate with other researchers from many fields.

What is it like studying at Newcastle?
Studying at Newcastle has been a great experience. There is a wide range of training, support and expertise available. You can always find someone to provide advice or guidance, whether it be relating to a technical problem or something broader.

What do you hope to do after your PhD?
After my PhD I hope to continue my research career and one day would like to obtain a research fellowship.

Rawan Alkahtani

What are you studying?
I’m a PhD student currently studying the effects of dental whitening on tooth enamel at the school of Dental Sciences.

Why did you choose Newcastle?
Newcastle University is renowned for its research facilities and advanced laboratory equipment, in addition to the brilliant research initiatives and the diverse group of highly qualified researchers.

What is it like studying at Newcastle?
Newcastle is a student friendly city with plenty of activities that are inclusive to all ethnicities and religions. The locals are very friendly and welcoming to international students.

What do you hope to do after your PhD?
Hopefully get involved in dental education and research
Other opportunities for research
Research for taught students
We are passionate at Newcastle University about giving opportunities and promoting research careers. Many of our undergraduate students become involved in research with opportunities ranging from informal projects to intercalated degrees. We run a Wellcome Trust funded INSPIRE scheme offering a number of activities to encourage dental students with research. We also welcome enquiries from students interested in undertaking research related placements and electives as part of their studies.

The Faculty of Medical Sciences run a popular MRes programme which includes a number of taught modules but also a major research project element and we host several MRes students each year undertaking dentally related projects.

Our postgraduate taught programmes within the dental school include an MSc in orthodontics and an MClinDent in restorative dentistry both of which include a research project.

Clinical Academic Careers
We advertise a number of posts each year for dentists interested in pursuing clinical academic careers. These posts are funded by NIHR and include both clinical training and protected time to develop research projects. Applicants must be eligible for UK GDC registration and where appropriate, specialist training in the UK.

Research posts and fellowships
We occasionally advertise positions for researchers to contribute to funded projects on an ad-hoc basis. In addition the university has a prestigious and highly competitive post-doctoral fellowship scheme, the NuACT scheme, which includes a 5 year paid position, research costs and PhD studentship.

The university is committed to equality and diversity in all aspects of its work including recruitment of researchers and holds a silver Athena SWAN award in recognition of this. We are fully committed to the development of researchers and are a signatory of the UK Concordat to Support the Career Development of Researchers.

For information on any of these opportunities, contact the Director of Research, Chris Vernazza on christopher.vernazza@newcastle.ac.uk
University infrastructure

In addition to our in house facilities, we have easy access to state-of-the-art instruments and expertise through the Newcastle University Core Facilities Service. These platforms include flow cytometry, bioimaging, electron microscopy, microbiome sequencing and bioinformatics.

Our facilities

We enjoy world class facilities in the School of Dental Sciences and across the university to enable us to undertake our world leading research. These facilities include our Dental Science Laboratories and our dedicated Dental Clinical Research Facility.
Dental Sciences Laboratories
The Translational Oral Biosciences laboratories are fully equipped for molecular biology, electrophysiology, cell and tissue culture, microbiology and biofilm modelling, and include a large Class II containment facility. The Dental Materials laboratories contain polymer synthesis facilities and standard mechanical and physical characterisation techniques such as mechanical testers, ion-selective electrodes and infrared spectroscopy. Within the School there is also a confocal fluorescence microscope and an atomic force microscope.

Northern Dental Practice Based Research Network
A recent addition to our portfolio is a network of research ready and engaged dental practices across the North East of England. Many of the practices have already been involved in delivering large scale research studies including the FICTION and IQUAD trials. This network of practices is a key component of our ability to undertake research which is meaningful and applicable to real life oral health care.

Dental Clinical Research Facility
The Dental Clinical Research Facility (DCRF) is a dedicated clinical research environment for conducting high quality clinical dental research within the Newcastle School of Dental Sciences and Dental Hospital. It is comprised of four dental surgeries and is supported by the Dental School’s three research laboratories. The facilities in the DCRF mean a full range of clinical dental research can be undertaken, including restorative dentistry, endodontics, periodontics, implant research, dental materials research, paediatric dentistry, local anaesthetic studies, fluoride therapy, nutritional research, and surgical procedures. In addition, two of the surgeries are equipped with operating microscopes for advanced surgical and restorative procedures.