**Available Projects for Intercalated BSc (iBSc) in Medical Science**

**2022-2023**

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**Projects Hosted by the Wellcome-Wolfson Institute For Experimental Medicine**

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| **Project Title** | **Investigating the influence of oxidative stress on endothelial progenitor cell function** | | | |
| **Supervisor(s)** | 1. Professor David Grieve 2. Dr Yuxin Wu | | | |
| **School / Centre** | SMDBS / Wellcome-Wolfson Institute for Experimental Medicine | | | |
| **Principal Supervisor’s Contact Details** | Email: [d.grieve@qub.ac.uk](mailto:d.grieve@qub.ac.uk) | | Tel: 028 9097 6468 | |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | ✓ |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | ✓ | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | Impaired angiogenesis is known to influence the progression of ischaemic cardiovascular disease. Recent attention has focused on the therapeutic potential of endothelial progenitor cells (EPCs), which are mobilised by ischaemia and are important in vascular homeostasis. Our group has characterised a distinct EPC subtype, termed endothelial colony-forming cells (ECFCs), with well-defined endothelial progenitor properties which promote new blood vessel formation in both health and disease. Oxidative stress, and specifically NADPH oxidases, is known to play a key role in cardiovascular disease and emerging evidence indicates that it is also a key regulator of EPC function. Specifically, we have shown that ECFCs are influenced by oxidative stress, display differential gene expression compared to mature endothelial cells, and are modulated by hypoxia which is a characteristic feature of the ischaemic microenvironment ([O’Neill et al, Cardiovasc Res 2020](https://pubmed.ncbi.nlm.nih.gov/30937452/)). | | | |
| **Aims / objectives** | This project therefore aims to investigate the specific influence of oxidative stress and NADPH oxidases on in vitro ECFC function. It is hoped that the results will identify key pathways which may become dysregulated in disease and could represent potential targets to enhance the reparative capacity of these cells and their clear potential for the treatment of ischaemic cardiovascular disease. | | | |
| **Techniques employed:** | In order to characterise the effects of oxidative stress and NADPH oxidases on ECFC function, studies will be undertaken in cultured cells treated with pro-oxidant compounds in the presence or absence of specific inhibitors of candidate pathways or after genetic manipulation. Expression of key signalling genes will be quantified by real-time RT-PCR and/or western blot and in vitro ECFC tube formation assays will be performed to assess functional effects. The student can realistically expect to make an important contribution to ongoing ECFC research which will be acknowledged through manuscript co-authorship. | | | |

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| **Project Title** | **Role of DREAM modification in steroid sensitivity** | | | |
| **Supervisor(s)** | 1. Dr Bettina C Schock 2. Dr Karim Dib | | | |
| **School / Centre** | SMDBMS, WWIEM | | | |
| **Principal Supervisor’s Contact Details** | Email: b.schock@qub.ac.uk | | Tel: 07828065833 | |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | x |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation |  | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | Cystic Fibrosis (CF) lung disease is characterised by chronic hyper-activation of the innate immune response. We are particularly interested in the regulation for the NF-kB signalling pathway by the regulatory protein A20. In CF epithelial cells, a lack of A20 contributes to the increased innate inflammatory response of the cells (*Kelly et al. Eur Respir J 2013*). Furthermore, the transcriptional repressor DREAM has been found to reduce A20 expression and our data indicate high DREAM expression in CF airway epithelial cell.  A20 remains high during inflammation due to a steroid responsive feedback loop. However, in CF this feed-back loop does not work because DREAM blocks A20 transcription.  Our hypothesis is that DREAM reducing drugs make CF cells more steroid sensitive. | | | |
| **Aims / objectives** | We have identified drugs that successfully decrease DREAM mRNA expression in CF airway epithelial cell lines. Here we want to investigate the synergistic effect of DREAM modifiers and steroids to reduce the inflammatory response in CF cells. | | | |
| **Techniques employed:** | CF and non-CF cell lines will be treated with the DREAM reducing drug metformin, stimulated with bacterial mimetic LPS in the presence of dexamethasone. The inflammatory response will be determined by ELISA (IL-8) and potential synergy determined using a specific software (Combenefit, sourceforge.net/projects/combenefit/  <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5018366/> | | | |

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| **Project Title** | **Evaluation of small molecules as modulators of the NLRP3 inflammasome** | | | |
| **Supervisor(s)** | 1. Rebecca Coll | | | |
| **School / Centre** | WWIEM | | | |
| **Principal Supervisor’s Contact Details** | Email:  r.coll@qub.ac.uk | | Tel: 028 9097 6473 | |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science |  |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | X | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | Inflammasomes are intracellular protein complexes that form part of the innate immune response to infection and injury. Upon activation, inflammasomes trigger the secretion of inflammatory cytokines such as IL-1β and cell death known as pyroptosis. Excessive activation of the NLRP3 inflammasome has been associated with many diseases including Alzheimer’s disease, Parkinson’s disease, atherosclerosis, non-alcoholic fatty liver disease, and asthma. Molecules that inhibit NLRP3 activation or that can modify the NLRP3 pathway can potentially be developed as therapies for these conditions with unmet medical needs. We previously characterised MCC950, a potent and specific small-molecule inhibitor of NLRP3 (Coll et al. Nature Medicine 2015 and Nature Chemical Biology 2019) however, other molecules that target this pathway need to be identified. We have a number of academic and commercial collaborations that aim to evaluate the effects of novel small molecules on inflammasome activation. We also investigate the effects of molecules currently in clinical development (e.g. heat shock protein inhibitors and kinase inhibitors) on inflammasome signalling, potentially supporting the repurposing of these molecules for NLRP3-dependent inflammatory diseases. | | | |
| **Aims / objectives** | The student will test inhibitors in a mouse macrophage cell line, in cells stimulated with NLRP3 activators (e.g. lipopolysaccharide and nigericin). They will measure inflammasome activation using assays for cell death, IL-1β secretion, and by Western blotting for IL-1β processing, caspase-1 activation, and ASC-speck formation. Inhibitor specificity will be evaluated by testing responses to AIM2 inflammasome stimulation and by measuring TLR-dependent cytokine secretion. Results will be confirmed in primary mouse bone marrow-derived macrophages and human macrophages. | | | |
| **Techniques employed:** | The student will receive training in the following lab techniques:   * Culture and stimulation of mouse and human myeloid cell lines and primary macrophages. * Preparation and use of small-molecule inhibitors * Enzyme-linked immunosorbent assays (ELISAs) * Western blotting * Cell death assays (e.g. LDH assays) * Immunofluorescence microscopy   The student will also learn and develop their skills in:   * Experimental design and analysis * Oral and written communication/presentation * Literature review and analysis | | | |

**Projects Hosted by the Centre for Medical Education**

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| **Project Title** | **From by-standing to stepping forward? The impact of forum theatre on developing medical students agency as bystanders when witnessing unprofessional practice** | | | |
| **Supervisor(s)** | 1. **Prof Gerry Gormley1** 2. Dr Davina Carr1 3. Dr Paul Murphy2 | | | |
| **School / Centre** | 1. CME, SMDBS 2) School of Arts, English and Languages | | | |
| **Principal Supervisor’s Contact Details** | Email: [g.gormley@qub.ac.uk](mailto:g.gormley@qub.ac.uk) | | | |
| **Degree Pathway for which project is suitable** | Medical Science | ✓ |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard for studentship application?** | *General awards*  Wolfson Foundation | ✓ | *Subject-specific awards* |  |
| **Background information:** | **Introduction**  As mandated by the General medical council (GMC), doctors are expected to challenge colleagues if they unfairly discriminate against patients or other colleagues. However, when individuals find themselves in such situations – they can experience the ‘bystander effect’ i.e. apathy towards ‘calling-out’ such unprofessional behaviour.  A wide range of teaching methods are used in bystander training for doctors and students. Many forms of such teaching often focus more on the more intellectual aspects rather than the behavioural dimensions of by-standing training. Intellectual forms of learning (such as reading materials and group discussions) can fall short of best preparing doctors and students in calling-out unprofessional practice. There can be a disconnect between what has *intellectually* been learnt and how to *act* in practice. There is a need to provide doctors and students a deeper understanding of how to ‘call out’ unprofessional practice ‘in the moment’. Experiential forms of learning such as simulation can create learning opportunities to gain a more embodied and behavioural learning experience. Of the many forms of experiential learning, Forum theatre lends itself to the subject matter of bystander training.  **Forum theatre: giving voice to the oppressed**  The methodology of Forum theatre, as an aspect of Theatre of the Oppressed (TOE), was founded by Augusto Boal, who was a Brazilian drama theorist, practitioner, and social activist. The theory was presented in Boal’s book The Theatre of the Oppressed - which was heavily influenced by Paulo Friere’s book The Pedagogy of the Oppressed. Boal first experimented with TOE in the barrios of Peru, using body actions and imagery, as part of a government run scheme to eradicate high illiteracy rates among the poorer communities in that society. The main concept of Forum theatre within TOE is to break down barriers which often exist in theatre, specifically between the actors and the spectators. A significant innovation is that during a scene the spectators can intervene directly in the dramatic action. This is achieved through a sequence of activities. Initially, the scene is performed by the actors. The scene is then repeated, and spectators are invited to take the place of an actor or guide the actor and decide what action to take, thus helping to change the outcome of the scene. The spectators effectively become actors; a change of status encapsulated in the neologism ‘spectactor’. The other actors must react instantly to new scenario. This method of Forum theatre, following the necessary adaptations, may be useful as a DA scenario teaching technique for medical students. The interactivity of Forum theatre evokes a desire to practice the act that has been improvised. Given the importance of making ‘in the moment’ decisions of such forms of experiential learning, it would be important to know what learners actually experienced and how this may impact their professional develop. | | | |
| **Aims / objectives** | In this study we aim to explore the lived experiences of medical students engaging in Forum theatre regarding calling-out unprofessional practice.  We will achieve this aim by the following objectives   * Establish a multiprofessional research team including PPI * Develop a forum theatre scene based on unprofessional practice * Pilot this forum theatre scene * Perform the forum theatre scene with medical students as participants * Elicit participants’ lived experiences of the forum theatre piece | | | |
| **Techniques employed:** | * Perform a literature review * Develop a research protocol and seek ethical approval * Develop and pilot a forum theatre scene regarding calling-out unprofessional practice * Recruit, sample and consent medical students to take part in the forum theatre scene * Capture participants’ experiences via interviews * Using hermeneutic phenomenology, with influences of Merleau-Ponty’s work on embodiment, data will be analysed using Template Analysis * Disseminate the work via conferences and published paper(s) * Scope where the outputs of this project could be implemented into medical curricula. | | | |

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| **Project Title** | **Angel Eyes: the impact of a virtual reality app simulating types of visual impairment on carers of visually impaired children.** | | | |
| **Supervisor(s)** | 1. Dr Michael Williams 1 2. Prof Jonathan Jackson 2 3. Prof Gerry Gormley 1 | | | |
| **School / Centre** | 1. Centre for Medical Education, School of Medicine, Dentistry and Biomedical Sciences 2. Department of Ophthalmology, Belfast Health and Social Care Trust | | | |
| **Principal Supervisor’s Contact Details** | Email: m.williams@qub.ac.uk | | Tel: | |
| **Degree Pathway for which project is suitable (**✔**)** | Medical Science | ✔ |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✔**)** | *General awards*  Wolfson Foundation | ✔ | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | Childhood vision impairment (VI) has many causes, including high refractive error, congenital cataracts, congenital glaucoma, congenital nystagmus, albinism, retinitis pigmentosa and optic atrophy. Each cause and level of severity impact different visual functions (visual acuity, visual fields, contrast sensitivity & colour vision) differently.  Clinical experience tells us that it is difficult for parents and carers of children with VI to understand what the child can and cannot see. For example, parents may assume that their child’s vision is clear with glasses, when this may not be the case. Alternatively they may not appreciate how much worse their child’s vision is at dusk or nighttime. Conveying information about this by clinical professionals to parents is often difficult.  Angel Eyes is a NI based charity that supports the parents and carers of children with VI. A team at Angel Eyes have developed a training programme involving a novel virtual reality (VR) app. The VR app immerses users in one of five scenes: a classroom, an outdoor park, a busy street, a bus and a living room. Eight aspects of vision can be modified, including visual acuity, contrast sensitivity, visual field size, glare disability and colour vision. Each of, or any combination of, these aspects of vision can be changed by the user, or remotely by a clinical demonstrator, to simulate different types of VI. Anecdotally, parents’ appreciation of the visual difficulties experienced by their child is often transformed by the app. However formal evidence of the impact of the app is lacking.  Our study will explore a person centred ophthalmology-related intervention: is there evidence for changed insights and behaviours of carers of children with VI after using the app?  The successful candidate will, through this project gain a detailed knowledge of the causes and effect of vision impairment, learn about the impact of childhood VI, in and learn how qualitative research can be used to gain insights and provide an evidence base. | | | |
| **Aims / objectives** | To explore the impact, on understanding, attitude and behaviour, of the Angel Eyes VI VR app on parents of children with VI, specifically, to compare:  - the impact on parents of younger and older children  - the immediate and longer-term impact, at 3 months | | | |
| **Techniques employed:** | 1. Purposeful sampling & recruitment of parents of children with VI 2. Design & delivery of an educational intervention, including time on the VR app 3. Capture of relevant outcome data before, immediately after & 3 months after the intervention, in the form of interviews & a questionnaire 4. Analysis of qualitative & quantitative data 5. Dissemination of findings | | | |

**Projects Hosted by the Centre for Public Health**

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| **Project Title** | **Cycling and low back pain** | | |
| **Supervisor(s)** | 1. Dr Neil Heron (Clinical Lecturer / Consultant in Sport and Exercise Medicine / GP) | | |
| **School / Centre** | Centre for Public Health | | |
| **Principal Supervisor’s Contact Details** | Email: N.Heron@qub.ac.uk | | Tel: |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | x |  |
| Biochemistry | x |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | x  x | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |
| **Background information:** | Cycling is a sport that is increasing in popularity (1, 2). However, given the unique ergonomics of the sport, combined with the repetitive nature and prolonged times in these positions, overuse injuries are common, chief among these being atraumatic low back pain (LBP) (3). Many mechanisms by which LBP is developed by cyclists have been postulated, among them maladaptive motor control patterns, muscular fatigue, maladaptive spinal changes and degeneration, incorrect bike fit, and even being attributed to uncomfortable cycling garments (5-14).  Atraumatic low back pain has been reported by 58% of professional cyclists, with 41% of them seeking medical attention and up to 22% losing time from activity due to their LBP (3). Not only does LBP cause time loss in training and require medical input, it reduces the athletes’ ability to train effectively (15). We therefore want to understand the risk factors for atraumatic back pain in cyclists as well as the most effective treatment modalities for this.  **References**  1. Yobbi, D. (1970, September 24). Bike boom DRIVES racing BOOM: USA Cycling SAYS participation numbers are up. Bicycle Retailer and Industry News. Retrieved September 25, 2021, from https://www.bicycleretailer.com/industry-news/2021/08/06/usa-cycling-says-national-race-participation-numbers-climbing#.YU9azmZKhTZ.  2. Lange, D. (2021, March 4). Topic: Cycling. Statista. Retrieved September 25, 2021, from https://www.statista.com/topics/1686/cycling/.  3. Streisfeld, G. M., Bartoszek, C., Creran, E., Inge, B., McShane, M. D., & Johnston, T. (2016). Relationship between body POSITIONING, muscle activity, and Spinal kinematics in cyclists with and without low back pain. Sports Health: A Multidisciplinary Approach, 9(1), 75–79. https://doi.org/10.1177/1941738116676260  4. Van Hoof, W., Volkaerts, K., O'Sullivan, K., Verschueren, S., & Dankaerts, W. (2012). Comparing lower lumbar kinematics in cyclists with low back pain (flexion pattern) versus asymptomatic controls – field study using a wireless posture monitoring system. Manual Therapy, 17(4), 312–317. https://doi.org/10.1016/j.math.2012.02.012  5. Burnett, A. F., Cornelius, M. W., Dankaerts, W., & O’Sullivan, P. B. (2004). Spinal kinematics and trunk muscle activity in cyclists: A comparison between healthy controls and non-specific chronic low back pain subjects—a pilot investigation. Manual Therapy, 9(4), 211–219. https://doi.org/10.1016/j.math.2004.06.002  6. Priego Quesada, J. I., Kerr, Z. Y., Bertucci, W. M., & Carpes, F. P. (2018). The association of bike fitting with injury, comfort, and pain during cycling: An international retrospective survey. European Journal of Sport Science, 19(6), 842–849. https://doi.org/10.1080/17461391.2018.1556738  7. Marsden, M. (2010). Lower back pain in cyclists : a review of epidemiology, pathomechanics and risk factors : review article. International Sports Medicine Journal, 11(1).  8. Teyeme, Y. W. (2019). An empirical analysis of potential cyclist injuries and cycling outfit comfort. Journal of Textile Science & Fashion Technology, 4(1). https://doi.org/10.33552/jtsft.2019.04.000578  9. Srinivasan, J., & Balasubramanian, V. (2009). Low back pain evaluation for cyclist using semg: A comparative study between bicyclist and aerobic cyclist. IFMBE Proceedings, 1140–1143. https://doi.org/10.1007/978-3-540-92841-6\_280  10. Srinivasan, J., & Balasubramanian, V. (2007). Low back pain and muscle fatigue due to road cycling—an semg study. Journal of Bodywork and Movement Therapies, 11(3), 260–266. https://doi.org/10.1016/j.jbmt.2006.08.009  11. Rajabi, R. (2006). Study of Low-Back Pain Among Cyclists. Harakat, (26), 73–84.  12. Zamiri, S., Yazdi, M. J., & Mehravar, M. (2017). The relationship between prolonged sitting position and ADAPTIVE alterations In lumbar spine and PELVIC range of motion in cyclists with chronic low back pain. World Family Medicine Journal/Middle East Journal of Family Medicine, 15(10), 23–27. https://doi.org/10.5742/mewfm.2017.93132  13. Pogliacomi, F., Pedrini, M. F., Pellegrini, A., Schiavi, P., Ceccarelli, F., & Costantino, C. (2016). Chronic low back pain in high level cyclists: comparison between two different treatments. Medicina Dello Sport, 69(3), 435–446.  14. Schultz, S. J., & Gordon, S. J. (2010). Recreational cyclists: The relationship between low back pain and training characteristics. International Journal of Exercise Science, 3(3), 79–85. | | |
| **Aims / objectives** | To undertake a systematic review of the evidence to assess the risk factors and management options for treating atraumatic back pain in cyclists?  The different cycling disciplines including road cycling, mountain bike, cyclocross and BMX, amongst others. | | |
| **Techniques employed:** | Undertake a systematic review of the evidence of the risk factors and management options available for treating atraumatic back pain in cyclists. | | |

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| **Project Title** | **Cycling and pregnancy** | | |
| **Supervisor(s)** | 1. Dr Neil Heron (Clinical Lecturer / Consultant in Sport and Exercise Medicine / GP) | | |
| **School / Centre** | Centre for Public Health | | |
| **Principal Supervisor’s Contact Details** | Email: N.Heron@qub.ac.uk | | Tel: |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | x |  |
| Biochemistry | x |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | x  x | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |
| **Background information:** | Exercise is generally safe during pregnancy. Pregnant women should be aiming to do 150 minutes of moderate intensity exercise each week, including muscle strengthening activities at least twice per week. Cycling is an ideal moderate intensity exercise.  General principles for women exercising when pregnant, in-keeping with current government physical activity guidelines, e.g. the United Kingdom government, are (taken from <https://www.rcog.org.uk/en/patients/patient-leaflets/physical-activity-pregnancy/> and <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/829894/5-physical-activity-for-pregnant-women.pdf> ):   * ‘Don’t bump the bump’ – consider the risk of falls and potential injury to you and the unborn child(ren) from any potential trauma; * Exercise during pregnancy is generally good for you and the unborn child; * Listen to your body and adapt your exercise accordingly; * Be extra cautious when exercising in the heat (ambient temperature >25oC and relative humidity above 45%) – aim to keep cool, comfortable and hydrated when exercising; and, * Generally avoid exercising for periods of greater than 1 hour at any one time.   The advice to be cautious when exercising in the heat and to avoid exercising for longer than 1 hour is due to the body temperature potentially exceeding an internal temperature of 39oC, leading to potential damage (‘teratogenic’ effects) to the unborn child(ren) (taken from <https://bjsm.bmj.com/content/53/13/799>).  However, for women who want to compete in cycling events, what should the guidance be for them in terms of their pregnancy and what stage of the pregnancy they are able to compete to? | | |
| **Aims / objectives** | To undertake a systematic review of the evidence to assess when pregnant women are able to compete safely during their pregnancy in the different cycling disciplines?  The different cycling disciplines including road cycling, mountain bike, cyclocross and BMX, amongst others. | | |
| **Techniques employed:** | Undertake a systematic review of the evidence of when women can safely compete in cycling events during their pregnancy and then produce a guideline to safely guide women on cycling competition during pregnancy. | | |

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| **Project Title** | **Exploring the impact of Food Insecurity on nutrition and health in Northern Ireland** | | | |
| **Supervisor(s)** | 1. Dr Claire McEvoy  2. Dr Anne Nugent | | | |
| **School / Centre** | 1. School of Medicine, Dentistry and Biomedical Sciences/CPH  2. School of Biological Sciences | | | |
| **Principal Supervisor’s Contact Details** | Email: c.mcevoy@qub.ac.uk | | Tel: 07454246985 | |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | x |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | x | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | Food insecurity, a condition of limited food availability due to inadequate resources, is a significant social determinant of health. The adverse effects of food insecurity on physical and mental health, including obesity, diabetes, and depression, have been suggested in children and adult populations. However, there is a paucity of research on food insecurity among Northern Irish adults, particularly as it relates to diet quality and risk of physical and mental health conditions. In Northern Ireland, food insecurity disproportionately affects younger adults/families and those who are unemployed or on low incomes. Understanding the impact of food insecurity on nutrition and health in vulnerable adults/families is critical to inform future policy and interventions to mitigate food insecurity. | | | |
| **Aims / objectives** | The overall aim of the project is to understand the determinants of food insecurity and the impacts of household food insecurity on nutritional intake and reported health status. | | | |
| **Techniques employed:** | * Recruitment of food insecure adults/families * Collection of quantitative data on food security, nutritional intake, nutritional status, and self-reported health * Dietary assessment and analysis * Data input and statistical analysis * Academic write-up   Depending on the student ability there will be an option to conduct qualitative research to understand the lived experience of food insecurity | | | |

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| **Project Title** | **Cross-sectional electrophysiological study of dementia syndromes using a dry-EEG headset to aid differential profiling of the disorder** | | | |
| **Supervisor(s)** | 1. Dr Emma Cunningham 2. Dr Aoife Sweeney | | | |
| **School / Centre** | Centre for Public Health, School of Medicine, Dentistry and Biomedical Sciences | | | |
| **Principal Supervisor’s Contact Details** | Email:  emma.cunningham@qub.ac.uk | | Tel: 028 9097 8971 | |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | ✓ |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | ✓ | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | Dementia is an umbrella term used to describe a number of distinct but often clinically overlapping syndromes (Keenan et al., 2016), including Alzheimer’s disease, dementia with Lewy bodies, vascular dementia and Parkinson’s disease dementia. Diagnosis of dementia is difficult and often at a late stage, when cognitive deterioration is advanced and the loss of neurons irreversible. Globally, the number of people living with dementia is set to increase from 50 million in 2018 to 152 million in 2050, a 204% increase (WHO, 2017). Early diagnosis of dementia is crucial, however it typically involves the use of expensive imaging techniques or painful lumbar punctures. As such, new diagnostic methodologies are required if we are to improve differential diagnosis rates. EEG (electroencephalography, or "brainwave" technology) has historically been used as a research and diagnostic tool in clinics and research labs. A cheap portable technology, such as EEG, could improve outcomes for patients and reduce costs for healthcare systems: early identification of cognitive dysfunction would ensure that patients see clinicians when necessary, while also allowing the healthcare team to have more information on their patient’s longitudinal condition. Trust ethics permissions are already in place for this project. | | | |
| **Aims / objectives** | 1. To determine if dry-EEG recordings and machine learning analysis can differentiate between different dementia syndromes 2. To evaluate if this dry-EEG headset is acceptable to patients through qualitative feedback | | | |
| **Techniques employed:** | This project will recruit patients with early stage dementia from memory clinics in the local Health and Social Care Trusts. Appropriate cognitive and EEG testing will be conducted and data analysis conducted. Training will be provided to the student by the research team. The student will:  1. Liaise with clinicians to recruit eligible patients  2. Conduct patient screening to determine study eligibility  3. Conduct research sessions with participants to include neuropsychological testing plus EEG recording  4. Conduct EEG and statistical analysis as appropriate, with training from supervisors  5. Collate data and draft a report  The student will be supported by the supervisory team including a medical doctor with experience in this area. Key skills obtained will include project management; participant recruitment; written communication for lay, clinical and scientific audiences; training in EEG data collection; data analysis and practical data protection experience. | | | |

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| **Project Title** | **Survey of attitudes towards delirium among patients, relatives and healthcare staff** | | | |
| **Supervisor(s)** | 1. Dr Emma Cunningham 2. Dr Aoife Sweeney | | | |
| **School / Centre** | Centre for Public Health, School of Medicine, Dentistry and Biomedical Sciences | | | |
| **Principal Supervisor’s Contact Details** | Email:  emma.cunningham@qub.ac.uk | | Tel: 028 9097 8971 | |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | ✓ |  | |
| Biochemistry |  |
| Microbiology |  |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | ✓ | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | People who develop delirium following surgery are at higher risk of complications in subsequent years, including cognitive decline, dementia, admission to a nursing home and death. Previous episodes of delirium are a risk factor for recurrent episodes of delirium. However, research suggests that diagnosis rates of delirium remain suboptimal and that knowledge of the risk factors for and management of delirium can be improved. Several clinical and best practice guidelines recommend that information pertaining to the person’s experience of delirium and risk factors for its recurrence be communicated to the patient at the time of discharge. However, what attitudes exist among patients, their families and healthcare staff pertaining to this? Are patients reassured and empowered by having more information or does this information worry them? | | | |
| **Aims / objectives** | 1. To determine what people in NI (and their families) who have had postoperative delirium want to know regarding their diagnosis. 2. To determine what attitudes the nursing staff hold regarding postoperative delirium and the level of clinical importance placed on it. | | | |
| **Techniques employed:** | This project will survey healthcare staff looking after people who develop delirium in the UK in order to establish what attitudes they have regarding delirium and communication of information to families. People who have experienced delirium and their families will also be invited to take part in this survey through advertisements. The student will:  1. Devise the survey questions  2. Compile a list of clinicians to contact and methods to recruit patients and families who have experienced delirium  3. Recruit participants  4. Set up a website and/or telephone interview protocol to record responses  5. Collate responses and draft a report  The student will be supported by the supervisory team including a medical doctor with experience in this area. Key skills obtained will include project management; written communication for lay, clinical and scientific audiences; data analysis and practical data protection experience. | | | |

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| **Project Title** | **Why do kidney transplants fail so early in young people?** | | | |
| **Supervisor(s)** | 1. Gareth McKay 2. Michael Corr | | | |
| **School / Centre** | Centre for Public Health | | | |
| **Principal Supervisor’s Contact Details** | Email: g.j.mckay@qub.ac.uk | | Tel: | |
| **Degree Pathway for which project is suitable (**✓**)** | Medical Science | 🗹 |  | |
| Biochemistry | 🗹 |
| Microbiology | 🗹 |
| **Is project of suitable standard / subject for studentship application? (**✓**)** | *General awards*  Wolfson Foundation | 🗹  🗹 | *Subject-specific awards*  British Assoc Dermatologists  Digestive Disorders Foundation  Pathological Society  Other ………………………… |  |
| **Background information:** | Kidney transplantation is the best form of treatment for young people with end stage renal disease (ESRD). Not only does it have a transformative impact on their quality of life, it dramatically reduces morbidity and mortality. In the last 20 years, over 300 young people have received a renal transplant in Northern Ireland (NI). Unfortunately, young recipients often lose their transplant much earlier than expected. Why transplant failure is more common in young people remains unclear and early detection of transplant dysfunction can be limited by clinical tests that lack sufficient sensitivity.  This study will characterise transplant loss in young renal transplant recipients in NI and assess epidemiological associations with long-term outcomes. Understanding why young recipients lose their transplant at higher rates will inform health services and interventions to prevent early loss of kidney transplants. | | | |
| **Aims / objectives** | 1.) Compare the incidence of transplant graft loss in Adolescent / Young Adult (A/YA) to the wider transplant population in NI.  2.) Identify the disease aetiology of NI A/YA recipients returned to ESRD i.e. acute kidney injury, immunological injury, disease recurrence  3.) Investigate key demographic details with long-term transplant outcomes in this population (such as, age of transplant, age of transition from paediatric to adult care, socioeconomic group etc.) | | | |
| **Techniques employed:** | The study population will be NI renal transplant recipients transplanted before the age of 30 from 2001-2021 inclusive. Data will be extracted from a prospective database of renal transplant recipients which is maintained by clinical staff in the Belfast Health and Social Care Trust (IRAS ID 239344, REC 18/NI/0004). This database contains demographic information such as age of transplantation, HLA matching and details of both donors and recipients. Additional data including subsequent outcomes (graft failure, mortality) will be ascertained from the electronic care record. Simple and descriptive bioinformatics statistical testing will investigate correlations between evidence of immunological injury and graft loss to determine associative links. | | | |