School of Medicine

Research projects and information for prospective students 2019

Honours, MPhil and PhD

V.5, 17 October 2018

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An overview of the Honours program H413

The Honours program in the School of Medicine is designed to build upon the skills and knowledge obtained from the completion of a three year undergraduate degree. The program aims to provide students with the opportunity to pursue an independent investigative research project in the areas of health and medicine along with relevant course work. This will enable students to expand their depth of knowledge in their chosen research area and provide a suitable qualification for entry into a higher degree by research program (Masters or PhD).

The School of Medicine program is a Type A Honours Degree, leading to award of a Bachelor of Health and Medical Sciences (Honours) (course code H413). This program, which comprises both coursework units and a research thesis, is undertaken over one year full-time. Each student is allocated a primary research supervisor and in some circumstances a co-supervisor.

Entry requirements

Applicants must have completed an accredited undergraduate degree in the broad area of health and medical science (of at least three years length) in a discipline related to the area of their research project. Applicants will require a mid-credit (>65%) average for the third year or equivalent of undergraduate study to be eligible for selection.*

Bachelor of Medicine Bachelor of Surgery (H311) students who do not meet the above requirement and wish to apply will require a minimum GAMSAT score of 60 and have successfully completed a minimum of 8 credit points of the Bachelor of Medicine Bachelor of Surgery course. Entry into H413 for Bachelor of Medicine Bachelor of Surgery (H311) students will be available at the end of the first, second or third year of the course and will be a competitive process.

*Entry will also be determined by the availability of supervisors and resources.

Course Structure of H413

The course comprises three Units, worth a total of eight credit points to be taken over one year of full-time study. The requirements include: an independent research project/thesis worth four credit points conducted under the supervision of the nominated supervisor for that project, a two credit point unit in research methods, and a two credit point unit in developing research skills in health and medical sciences. The course will be structured in the following way:

HMH401: Developing Research Skills	2 credit points (Trimester 1)
HBS400: Research Methods	2 credit points (Trimester 1)
HMH402: Honours Research Project	4 credit points (Trimester 2)

HMH401: This Unit will provide you with a thorough understanding of your research field through the generation of a research proposal whilst at the same time helping you to develop skills essential to research, including online literature searching, presentation skills and critical analysis of literature. Assessment involves the development of a research

proposal, the completion of a literature review and an oral presentation of the research findings prior to submission of the thesis.

HBS400: This is a Faculty-wide Unit comprised of a series of modules, in which the students must complete a required number of modules. Students select modules that are the most relevant to their project and in areas in which they require support. All modules are completed and assessed in Trimester 1.

HMH402: This Unit involves the implementation of the research project. While the enrolment is in Trimester 2, students will actually commence their research project in Trimester 1. The assessment for this Unit is writing up the research in a thesis format that includes a literature review, research methodologies, research results and a discussion of the findings. The literature review (which is undertaken as part of HMH401) will be only assessed in relation to the relevance to the project and the hypothesis and aims.

- Developing Research Skills Trimester 1 2 credit points
- Research Methods Trimester 1 2 credit points
- Research Project/Thesis Trimester 2 4 credit points

The Honours year is an exciting year because it provides the first real opportunity to get a feel for research and students develop a wide range of research and problem-solving skills. However, students should be aware that this year is a challenging and demanding year, involving at least 35 hours per week of study and/or research work.

Honours Scholarships

Commencing Honours students are eligible to apply for merit-based Scholarships to the value of $1,000 and $2,000. Individual supervisors may offer additional funding.

Contact details

For further information, please contact the Honours Course Director:

Assoc Prof John Stambas
Phone: (03)5227 5740
Email: john.stambas@deakin.edu.au

Applying for Honours

To apply for Honours in the School of Medicine please follow the steps below:

1. Select a research project
Examine the list of research projects that the school is offering for 2018. For those projects that you are interested in, you must personally contact the named supervisor to discuss the proposed project. The supervisors contact details are provided together with the project description. This will enable you to gauge whether the research project aligns with your career goals, and enables the supervisor to establish whether you have the appropriate academic background to undertake and complete the research project.

2. Complete the project preference form
This form is provided in this booklet. Email the form to som-clinical@deakin.edu.au or post to Admissions & Placements Team (School of Medicine, Deakin University, Locked Bag 20000 Geelong, Vic. 3220) by **November 9, 2018.** This form MUST be filled out so that projects can be allocated to students based on the criteria outlined below.

3. Submit an on-line application
All prospective honours students MUST also apply directly to Deakin University. Submit an online application at http://applicantportal.deakin.edu.au/connect/webconnect. Closing dates for applications is **November 9, 2018**.

- You will need to register as a user in order to apply. Select the 'Register' link to activate a username and password to gain entry to the online application. NOTE: Current Deakin students – your Deakin username and password will not gain you access to the online application.
- Complete all of the questions on the online application. NOTE: Referee details are not required
- Complete the final step ONLY if your undergraduate studies were NOT undertaken at Deakin University. This final step requires applicants to upload scanned and certified copies of their University academic transcript(s).

4. Project allocation

Students will be allocated a project based on a combination of student preferences, supervisor's student preferences and a mid-credit (>65%) average for the 3rd year or equivalent of undergraduate study. Successful candidates will be advised of their offer during end Nov-early Dec 2018.

The projects on offer within the School of Medicine reflect the expertise and research that is currently undertaken by the prospective supervisors at Deakin and at our affiliate institutes. It must be noted that due to the nature of research, the focus and direction of a research group may change over time and the final project may not necessarily be exactly as described.

Please refer to the website for any further information on Honours in the School of Medicine: http://www.deakin.edu.au/medicine/research .

2019 Honours Project Preference Form

Your name: _____

Address: _____

_____ Postcode _____

Contact Phone Number: _____

Email: _____ Deakin student ID: _____

Applicants are advised that allocation to research projects is a competitive process and an applicant cannot be assured of being assigned to their choice of research projects.

Please nominate below three preferences, in order, for an Honours project (and supervisor) for 2019 from the list of projects on offer.

1st preference - Project reference number: _____

Project title: _____

Supervisor: _____

Have you personally spoken with the supervisor about the project? Yes ☐ No ☐

2nd preference - Project reference number: _____

Project title: _____

Supervisor: _____

Have you personally spoken with the supervisor about the project? Yes ☐ No ☐

3rd preference - Project reference number: _____

Project title: _____

Supervisor: _____

Have you personally spoken with the supervisor about the project? Yes ☐ No ☐

If you are NOT offered one of the above projects would you consider an offer of an Honours project in a related area?
Yes ☐ No ☐

Please email to som-clinical@deakin.edu.au or post to Admissions & Placements Team **(School of Medicine, Deakin University, Locked Bag 20000, Geelong, Vic 3220) by November 9, 2018.**

An overview of the Master of Philosophy program H800

The Master of Philosophy (MPhil) course is an elite intensive postgraduate research degree, providing students with the opportunity to pursue an independent investigative research project along with specialised coursework that is designed to provide skills in research design, the interpretation and communication of research and an understanding of research integrity.

The MPhil will suit students who are inquisitive, analytical and interested in pursuing higher coursework skills and further research in the health and medical sciences field. The MPhil is specifically designed to provide students from diverse undergraduate backgrounds with an opportunity to expand their knowledge base and become an independent researcher with specialised technical, critical thinking, communication and cognitive skills. These skills are highly sought by many employers, with the course providing students with a dedicated pathway into both national and international PhD programs or into careers, both local and globally, within academia, industry, medical research as well as government and non-government scientific agencies.

The MPhil course comprises both coursework units and research under the guidance of a supervisor, culminating in a research thesis. The program is undertaken over 18 months-two years full-time (or full-time equivalent).

Entry requirements

Applicants must have successfully completed one of the following to be eligible for selection*:

- Bachelor degree with a distinction average (70%) for the third year or equivalent in the same discipline as the proposed research thesis.

  OR

- Coursework Master degree with a minimum credit average (65%) in the same discipline as the proposed research thesis.

  OR

- Completion of the pre-clinical component of the Bachelor of Medicine Bachelor of Surgery (or equivalent degree) at the postgraduate level.

International Students must also possess an overall IELTS score of 7 with no band less than 6.5 (Band C or equivalent)

*Entry will also be determined by the availability of supervisors and resources.

Course structure of H800

HMH812 Research Thesis. Students will work continuously on their research project over an 18-month to two-year period of full-time study (~36 hrs/week). Students are eligible for four weeks of leave each year. It is possible to enrol part-time at 0.5 FTE.

Geelong Waurn Ponds Campus
75 Pigdons Road Waurn Ponds VIC 3216 Australia

In addition, students need to complete 4 credit points of research training coursework units within the first year (FTE) of the course.

HMH810 Research Communication (2 credit points) – Available Trimester 1 or Trimester 2.

HMH811 Research Interpretation and Integrity (1 credit point) – Available Trimester 1.

And one of:

HMH800 Research Design (1 credit point)- Available Trimester 1 or 2
or
HSH746 Biostatistics 1 (1 credit point) – Available Trimester 1.

The Trimester in which the coursework will be undertaken will be determined by the enrolment date and after consultation with the Course Director.

HMH800: In this unit, students will learn how to design a research project, how to formulate a research hypothesis and develop aims along with appropriate study design to test the hypothesis. The unit places a strong emphasis on developing the student's understanding of various statistical tests by which to analyse research data, including relevant software. It will also emphasise appropriate professional practice in the workplace and compliance with regulatory authorities.

HMH810: This Unit will engage students to learn and develop communication skills that are fundamental for a career in research but which will also have broad application in careers other than research. The topics that will be covered include developing effective written and verbal communication skills to interpret and transmit a body of knowledge in the discipline of medical research to specialist and non-specialist audiences, and will incorporate how social media can be used to communicate research and build a researcher's profile. It will include written presentations of a literature review and the research project as well as a verbal presentation of the research proposal.

HMH811: This unit will teach students the philosophies, ethics and principles of research integrity. It will also provide students with the skills to be able to critically analyse literature in their discipline for their strengths and weaknesses.

HSH746: This is an introductory unit on biostatistics. In this unit, students will explore the philosophical basis of statistical thought, examine fundamental statistical concepts and methods and explore their application in a variety of health settings. The delivery of the Unit is designed to facilitate the syntheses of the basic components of learning through practical exercises, statistical computing labs and the application of biostatistical techniques to realistic health-related data. The main topic areas covered will include: descriptive statistics, hypothesis testing, confidence intervals, comparison of means, inference on proportions, contingency tables, correlation and basic regression concepts.

Contact details

For further information, please contact the MPhil Course Director:

Prof Tania de Koning-Ward
Phone: (03)5227 2923

Email: taniad@deakin.edu.au

Please refer to the website for any further information on MPhil in the School of Medicine: http://www.deakin.edu.au/medicine/research .

Course Fees

If you are a successful applicant for research degree candidature, and you are an Australian citizen, permanent resident or New Zealand citizen, you will not pay any tuition fees.

You also do not need to pay the University's Student Services and Amenities Fee (SSAF).

For all other applicants, course fees apply. Please refer to **www.deakin.edu.au/courses/fees**

Applying for MPhil

The application process requires all prospective MPhil students to:

Examine the research disciplines or research projects on offer in the School of Medicine. For projects/topics that you are interested in, it is mandatory that you contact the named supervisor to discuss the proposed project. This will enable you to gauge whether the research project aligns with your career goals, and enables the supervisor to establish whether you have the appropriate academic background to undertake and complete the research project. The supervisor needs to confirm that they agree to take you on as a student.

As this is a Higher Degree by Research, an online application needs to be submitted directly to Deakin University using the following link: **www.deakin.edu.au/research/become-a-research-student/how-to-apply-research-degrees .**

Note that the application form requires an applicant to provide a one page outline of their proposed research program and this needs to be undertaken in consultation with the supervisor. More information for international students can be obtained from **www.deakin.edu.au/international-students .**

Enrolment dates: Note that the processes for accepting enrolment are different to undergraduate courses and the time can be lengthy (can take up to 8 weeks). For international students, the process will be even lengthier due to VISA applications, etc. Whilst students can enrol for candidature and thus commence the research component at any time, it is recommended that students are ready to commence in either the beginning of February or beginning of July to allow sufficient time for orientation and safety training and commencement of coursework in either Trimester 1 or 2. Accordingly, it is requested that **applications are submitted either by:**

- **End November** for commencement in February the following year, with coursework beginning in Trimester 1.
- **Beginning of May** for commencement in July the same year, with coursework beginning in Trimester 2 of that year.

An overview of the Doctor of Philosophy H960/H961

The key to entry (besides meeting entry qualifications) into a PhD Xtra or Masters by Research program is the support of a School of Medicine staff member to supervise you. It is essential, therefore, that you discuss your application for one of the listed projects with the relevant supervisor(s) prior to applying. Note the application form requires an applicant to provide a one page outline of their proposed research program.

Applying for PhD

Applications for candidature are accepted at **any time**; however for applicants seeking scholarships please note the appropriate closing dates shown below. With the support of a supervisor, submit an application.

The application and scholarship can be found at: http://www.deakin.edu.au/research/become-a-research-student/how-to-apply-research-degrees and http://www.deakin.edu.au/courses/scholarships/find-a-scholarship/rtp-and-duprs . Applications from domestic scholarships close at the end of **October** each year.

Additional information for International applicants can be found at:
http://www.deakin.edu.au/research/become-a-research-student/international-research-students.

Applications for scholarships from International students close at the end of **July** each year.

Abbreviations

CMMR	Centre for Molecular & Medical Research
COCPH:	Centre for Organisational Change in Person-Centred Healthcare
CPHR	Centre for Public Health Research
CREM	Centre for Rural Emergency Medicine
DRH	Deakin Rural Health
GCEID	Geelong Centre for Emerging Infectious Diseases
IMPACT	Centre for Innovation in Mental and Physical Health and Clinical Treatment
NCFH	National Centre for Farmer Health
SOMERG	School of Medicine Education Research Group

Bioethics

Project reference: 1428

Ethical, legal and social implications of epigenetics and development origins of health and disease

Supervisor/s: Jeffrey Craig, Maurizio Meloni, Evie Kendall

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Recent research has begun to identify genetic and environmental factors that are risk factors for a wide range of chronic disorders, from heart disease and diabetes, to autism and schizophrenia. Most importantly, there is now increasing evidence that we are most vulnerable to these risk factors in our first one thousand days. The proposed project will consider the ethical, legal and social implications of studies into epigenetics and the development origins of health and disease, paying particular attention to the need to balance the potential benefits of such knowledge for disease prediction, diagnosis, intervention and tracking, with the possible risks of causing social harms, such as stigmatisation or discrimination in health insurance. A central concern will be comparing the medical and socio-political impacts of risk factors that can be partially controlled, and those that are entirely beyond our influence. As the field of epigenetics continues to grow and more information becomes available about the genetic and environmental factors responsible for our health, there is an urgent need for sound ethico-legal evaluation of this field.

This is a timely project in light of recent media attention regarding advances in cutting-edge biotechnologies, including CRISPR gene editing, and the fact the annual Development Origins of Health and Disease (DOHaD) World Congress is due to be hosted in Melbourne in 2019.

Contact supervisor:

Assoc. Prof. Jeffrey Craig (Barwon Health): jeffrey.craig@deakin.edu.au

Suitable for: MPhil, PhD

Cancer

Project reference: 1478

How small can we go? Targeted medical imaging for the early detection and treatment of cancer

Supervisor/s: Sarah Shigdar, Giovanni Mandarano

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Cancer is a devastating and debilitating disease that is still one of the major causes of mortality and morbidity in Australia. In order to more effectively treat the disease, early detection is required so patients can be diagnosed at an earlier stage. Current methods are time consuming, invasive, non-specific, or all three. While the use of PET or MRI has allowed clinicians to detect some tumours and offer better information on their location, they do not detect small metastatic lesions. As these imaging methods also use non-specific contrast agents, some tumours can be completely missed. In order to develop a better, more specific imaging method for PET, agents which bind to specific markers on the cancer cells are required. Aptamers are an emerging field of novel agents that can be considered superior to conventional agents due to their capacity to bind to their target in a highly specific and sensitive manner. These small nucleic acids can home-in and bind to their target sites with high levels of specificity and sensitivity. As well, aptamers can be easily modified to deliver different contrast agents, thus providing an accurate guide to the required sites for cancer detection via PET imaging. In addition, these contrast agents can also act as therapeutic agents, allowing the patient to be treated at the same time that they are undergoing diagnostic procedures. This project will investigate several conjugation strategies for the successful radiolabelling of aptamers and confirm that this modality is capable of specifically detecting cancer cells, as well as assessing the radio-chemical properties are retained.

The techniques involved include; a variety of spectroscopy techniques, particle size imaging and measurement, Thin Layer Chromatography, endotoxin analysis.

Contact supervisor:
Dr. Sarah Shigdar (School of Medicine): sarah.shigdar@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1477

Unlocking the potential of targeted drug delivery to the brain

Supervisor/s: Sarah Shigdar, Emma Hays

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

The blood brain barrier is impenetrable to the vast majority of drugs. This is a formidable barrier which protects the brain against harmful chemicals and is generally considered to be a good thing in healthy people. However, this makes treating brain disorders such as brain cancer or neurodegenerative disorders very difficult as treatments must pass through this barrier to get to the tumour. Recent developments in brain physiology have shown that targeting and binding to receptors on the cells of the blood brain barrier will transport molecules across this formidable barrier into the brain. We have designed smart small nucleic acids, known as aptamers that can target specific tumour cells.

Aptamers are an emerging field of novel agents that can be considered superior to conventional therapeutic agents due to their capacity to bind to their target in a highly specific and sensitive manner. Recent research suggests that aptamers may be superior therapeutic agents due to their small size and tuneable binding affinity. Aptamers are also produced in the laboratory under controlled conditions, with little chance of batch-to-batch variability, which offers greater reliability for downstream applications. This project aims to exploit the intrinsically superior properties of aptamers to produce advanced therapeutic options for the treatment of brain cancers.

Aptamers can easily be modified for the attachment of drugs which can then be transported directly into tumour cells. This project will investigate the ability of an aptamer specifically designed to target a receptor on the cells of the blood brain barrier to not only be transported into the brain, but to deliver drugs to specific populations of cells in the brain, thereby mitigating some of the neurotoxic effects associated with other treatment strategies.

This project will use flow cytometry, confocal microscopy, molecular biology techniques and cell culture.

Contact supervisor:
Dr. Sarah Shigdar (School of Medicine): sarah.shigdar@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1467

The evaluation of the multidisciplinary Cachexia Support Clinic- the patient perspective

Supervisor/s: Vanessa Vaughan, Peter Martin, Scott McCoombe

Location: Waurn Ponds Campus

Research centre: Other

Project description:

50% of cancer patients develop muscle cachexia (wasting), suffering a loss of up to 30% of their original body weight. Interestingly, the weight loss associated with cancer cachexia is not due to a decrease in dietary intake, but rather a specific inflammatory catabolic response. In addition, when cancer patients develop cachexia they also have a decreased chance of survival and often must stop curative therapies. Established in 2008, the Barwon Health Cachexia and Nutrition Support Service (CNSS) is the only clinical service of its kind currently operating in Australia. Patients referred to the CNSS meet with an interdisciplinary team designed to maximise nutritional support, functional muscle strength, and attenuation of symptoms associated with cancer cachexia. The clinic also includes an emphasis on psychosocial issues of the cachexia syndrome. Through the patient's account of his or her experience and qualitative analysis of the discourse, we can gain insights into the context of patient and carers perceptions of value and experience associated with a cachexia-specific intervention service.

A prospective study of qualitative interview data collected from patients and carers attending the Cachexia & Nutrition Support Service will be conducted, in order to evaluate the patient's and carer's perspective of the current streamlined multidisciplinary clinic approach. By identifying common themes through patient and carer feedback, it will assist in the future development and refinement of clinical procedures which strongly align with patient requirements within this innovative service. The study will utilise a purposeful sample 12 patients commencing the CNSS program. Patients will be selected to ensure that the diversity previously described in this population is reflected, with particular focus on obtaining a heterogeneous sample in order to capture the spectrum of patient experience.

Contact supervisor:
Dr. Vanessa Vaughan (School of Medicine): v.vaughan@deakin.edu.au

Suitable for: MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1466

Monitoring of physical activity of patients with cancer cachexia in a community setting

Supervisor/s: Vanessa Vaughan, Peter Martin, Scott McCoombe

Location: Waurn Ponds Campus

Research centre: Other

Project description:

An estimated 50% of cancer patients develop skeletal muscle cachexia (wasting), suffering a significant loss of up to 30% of their original body weight. In addition, when cancer patients develop cachexia they also have a decreased chance of survival and often must stop curative cancer therapies. Despite the prevalence of cancer cachexia, to date there is no cure or very few therapies that can slow or prevent the development of the condition. Most patients with the condition live in a community setting (not hospital) and normally only receive clinical support every 4 - 6 weeks. This mode of managing patients with cachexia means that data relating to their lifestyle is collected infrequently and relies on patients remembering behaviours in-between clinical visits.

This project will provide students with the opportunity to participate in a pilot study that shall test the suitability of using 'off the shelf' activity monitoring devices e.g. Fitbit, in patients with cachexia. The data will then be compared with similar data collected via specifically designed (more expensive) telemetry devises patients wear and traditional activity diaries. Students will be required to travel with the supervisors of the project to collect data in the Geelong region along with analysing additional data that has been collected by community palliative care nurses from the same region. Data collected will undergo statistical analysis using methods such as repeated measure AVOVA, linear regression and other regression models to determine if a patients' status has declined between clinic visits and if that change can be used to initiate earlier clinical intervention(s).

Contact supervisor:
Dr. Vanessa Vaughan (School of Medicine): v.vaughan@deakin.edu.au

Suitable for: MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1460

Locked nucleic acid modified PD-L1 aptamer pulsed dendritic cells for cancer immunotherapy

Supervisor/s: Jagat Kanwar

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

BACKGROUND: Cancer is one of the leading cause of deaths around the world. In the last two decades cancer immuno-therapeutics targeting in tumour cell biology has become a popular field in oncology. The development of antibodies or monoclonal antibodies (Abs/mAbs) therapies against immune regulatory molecules including cytotoxic T lymphocyte associated antigen 4 (CTLA-4) and programmed death 1 (PD-1)/programmed death ligand 1 (PD-L1) have shown positive results in the clinical trials to boost the cancer patients immune system. However, these Abs/mAbs therapies again have many limitations including, poor internalisation and development of autoimmunity. Aptamers also known as chemical antibodies have the potential to mimic as antibodies with higher tissue penetration due to small size, less cytotoxicity and no immunogenicity. In addition, multifunctional iron loaded bovine lactoferrin (Fe-bLf) is an immunomodulatory protein in milk and able to induce cancer cell specific apoptosis to clear the tumor cell while sparing the normal body cells.

AIMS: Locked nucleic acid modified PD-L1 aptamer (LNA-aptPD-L1) pulsed activated DCs along with bLf stimulate costimulatory molecules and eradiate tumors and develop permanent systemic anti-cancer immunity.

PLAN AND OUTCOMES: First time we addressing the role of LNA modified PD-L1 antagonizing DNA aptamer (LNA-aptPD-L1) on the immunity modulation and the ability of immune cells to successfully recognise and kill the cancerous cells. These LNA-aptPD-L1 pulsed dendritic cell based cell therapy will kill cancer cell as well as cancer resistant stem cells. This cell based cancer immunotherapy targeted tumour sites to clear cancer cells faster and gain systemic cancer immunity. This proof of concept study for pancreatic cancers could later be translated into human trials and other cancer types.

TECHNIQUES: Protein chemistry, molecular biology, immune-histopathology and development of ex vivo or 3D models.

Contact supervisor:

Prof. Jagat Kanwar (School of Medicine): jagat.kanwar@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1419

Identification of metabolic vulnerabilities in cancer

Supervisor/s: Sean McGee

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

All cancer cells reprogram their metabolism to support their rapid proliferation and growth and this metabolic reprogramming has also been linked to resistance to cancer treatments. While it has been known for some time that cancer cells increase glycolysis to provide energy, it is becoming apparent that oxidative metabolism has an equally important role by providing metabolites for lipid, protein and nucleotide synthesis and for balancing redox state. This raises the possibility that inhibitors of various metabolic pathways could be used to prevent cancer progression and enhance sensitivity to existing treatments.

Using our expertise in metabolic profiling, we have developed an approach to identify metabolic vulnerabilities in cancer cells that could be exploited therapeutically. This project will profile the metabolism of breast, prostate, brain and liver cancer cells to identify metabolic vulnerabilities, which will be targeted to examine the effect on cancer cell proliferation and survival and response to cancer therapies. Flux profiling of major metabolic pathways will be performed using extracellular flux analysis and cellular proliferation and death responses will be determined using electrical impedance monitoring. Molecular biology approaches including western blotting, real time RT-PCR and biochemical approaches such as metabolite measurements will be used to determine the molecular mechanisms involved.

This project will increase our understanding of how cancer cells reprogram their cell metabolism to proliferate and survive, and could also reveal new treatment approaches for cancer.

Contact supervisor:
Assoc. Prof. Sean McGee (School of Medicine): sean.mcgee@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1411

Understanding how a tumour-enriched transcription factor regulates gene expression

Supervisor/s: Amardeep Dhillon, Jet Phey Lim

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

A major interest of our laboratory is to better identify and characterise key regulators of gene expression programs required for tumour cell invasion and metastasis. One strong candidate for this role is the Activator Protein-1 (AP-1) transcription factor complex, which consists of dimers formed mainly by members of the Fos (c-Fos, FosB, FRA1, FRA2), Jun (c-Jun, JunB, JunD), ATF and MAF families.

Fos Related Antigen-1 (FRA-1) is one of the most frequently overexpressed AP-1 protein in solid cancers, including tumours of the head and neck, brain, pancreas, lung, breast, bladder, colon, and thyroid. High FRA1 levels are associated with poorer outcomes in these cancers and have been shown to be an important driver of tumour cell migration, invasion and metastasis. To better understand how FRA1 regulates genes involved in these processes, we have been using proteomic approaches to analyse the composition of FRA1 complexes in tumour cell lines.

This project will involve validating the association of FRA1 with several candidate interactors identified in our proteomic experiments and mapping the relevant binding regions between FRA1 and confirmed interactors. The student will also test the binding of these novel interactors to FRA1-regulated genes and use knockdown/overexpression approaches to determine if the ability of FRA1 to control pro-malignant gene expression in tumour cell lines is dependent on its association with specific interactors.

Techniques to be used in this project include molecular biology (cloning, chromatin immunoprecipitation, qPCR), cell biology (cell culture, transfection) and protein analysis (immunoprecipitation, western blotting).

Contact supervisor:
Assoc. Prof. Amardeep Dhillon (School of Medicine): amardeep.dhillon@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1410

Characterising the role of a chromatin remodelling enzyme in cancer progression

Supervisor/s: Amardeep Dhillon, Yann Gibert

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Invasion and metastasis pose major challenges for the clinical management of cancers. At the molecular level, these processes require the activation or repression of specific subsets of genes. The identification of regulators of these gene expression changes may thus illuminate new avenues to treat metastatic cancers.

This project will focus of a chromatin remodeling enzyme that is under-expressed in a variety of solid tumour types (eg. lung, breast and colon). Previous studies have shown that reduced levels of this protein accelerate tumorigenesis by inducing genomic instability. Our preliminary studies suggest that under-expression of this protein can also facilitate cancer progression by activating gene expression programs involved in invasion and metastasis. This project aims to understand the molecular basis of these findings.

The studies will involve knockdown or re-expression of this chromatin remodeler in breast and colon cancer cell lines to determine the role in regulating: (1) activity of specific signaling pathways, (2) chromatin dynamics (histone modifications, chromatin accessibility, RNA polymerase II occupancy) at genes involved in invasion and metastasis, and (3) different steps involved in metastasis using zebrafish embryo xenotransplantation models.

Techniques used in this project will include molecular biology (cloning, chromatin immunoprecipitation, qPCR), cell biology (cell culture, transfection, assessment of cell proliferation, anchorage-independent growth and migration), protein analysis (western blotting), microscopy, xenotransplantation in zebrafish larvae, zebrafish metastasis assays.

Contact supervisor:
Assoc. Prof. Amardeep Dhillon (School of Medicine): amardeep.dhillon@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1409

Delineating oncogenic transcription effector networks

Supervisor/s: Amardeep Dhillon, Larry Croft

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Many human cancers harbor mutations or other lesions that drive persistent activation of the ERK signal transduction pathway, a critical regulator of pro-malignant gene expression programs required for tumours to grow and spread. Although much is known about the mechanisms regulating ERK signaling in cancer cells, a key unresolved question is which transcriptional effectors the pathway engages to drive pro-malignant gene expression.

This project will focus on delineating transcription factor (TF) networks that orchestrate the activation of pro-malignant gene expression downstream of the ERK pathway in colorectal and pancreatic cancer cells. As such networks typically involve the binding of combinations of TFs to the regulatory regions of genes, the first part of this project will use bioinformatics to interrogate our in-house and public datasets (eg. ENCODE) to identify patterns of binding of candidate ERK-regulated TFs to pro-malignant genes. Functional studies will then evaluate the effects of knockdown or overexpression of TFs on chromatin state (histone modifications, chromatin accessibility) and association of the basal transcriptional machinery (RNA Polymerase II) with specific genes. Finally, using TF binding patterns identified above, reporter constructs will be generated to examine the activity of ERK-regulated TF networks in cancer cell lines and to facilitate future functional screens to identify potential small molecule disruptors of these networks.

A variety of techniques will be used over the course of this project, including molecular (cloning, chromatin immunoprecipitation, qPCR), cell biological (cell culture, transfection, assessment of cell proliferation, anchorage-independent growth and migration), protein analysis (western blotting) and bioinformatics.

Contact supervisor:
Assoc. Prof. Amardeep Dhillon (School of Medicine): amardeep.dhillon@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1399

Regulating altered metabolism in paediatric rhabdoid tumours

Supervisor/s: Rasika Samarasinghe, Sean McGee

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Rhabdoid tumours are rare, yet highly aggressive cancers found in infants, mainly arising in the brain, kidney and lungs. Median survival after diagnosis is 9 - 12 months and 5-year survival is less than 1%. Despite intensive multimodal treatment regimens, adverse treatment associated side effects and relapse of tumours are frequent events in these cancers leading to poor survival rates.

Deregulated cellular metabolism is a key characteristic of cancer cells. Mounting evidence has shown that alterations in metabolic pathways are associated with neoplastic transformation, tumour progression and metastasis. It has also been shown that if cancer cells do not maintain this altered metabolic state, cells undergo cell cycle arrest and cell death. We have found that a class of epigenetic therapies, known as histone deacetylase inhibitors (HDACi) play a major inhibitory role in the growth of various different cancers, including rhabdoid tumours. However, the mechanism of how these therapies induce cancer cell death remains unclear. Using various cellular and molecular techniques, this project will examine the metabolic activity of rhabdoid cancer cells and evaluate whether HDACis induce cell death by altering metabolic pathways in cancer cells. This project will utilize cell culture, Seahorse metabolic analysis, flow cytometry and molecular biology techniques.

Contact supervisor:
Dr. Rasika Samarasinghe (School of Medicine): rasikas@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1386

Development of novel nucleic acid aptamer-based diagnostics and therapeutics

Supervisor/s: Wei Duan

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Aptamers (also known as chemical antibodies) are short chemically synthesised single-stranded RNA or DNA oligonucleotides that specifically bind to molecular targets with high affinity and specificity. Aptamers fold into tertiary conformations and bind to their targets through shape complementarity at the aptamer-target interface via van der Waals forces, hydrogen bonding and electrostatic interactions. The binding of an aptamer to a protein can modulate protein functions by interfering with protein interaction with natural partners. Aptamers have the unique ability to bind to small organic and inorganic molecules, in addition to recognizing and binding to large targets, such as proteins, whole cells or even organs. Similar to antibodies, aptamers gain entrance to target cells via receptor-mediated endocytosis upon binding to cell surface ligands. In addition, the in vitro generation of aptamers via SELEX confers a low cost advantage over the long and arduous development process of antibodies. Importantly, aptamers can penetrate into tumor cores much more efficiently than antibodies due to their ~20-25-fold smaller sizes compared with full sized monoclonal antibodies.

In this project, the student will be involved in the selection of aptamers against biomarkers relevant to cancer diagnosis and targeted delivery of drugs. Specifically, students will learn to culture human cells, to perform molecular biological experiments (cloning, PCR and next generation sequencing), to produce mammalian protein in cell culture settings, to use flow cytometry, confocal microscopy and fluorescence-activated cell sorting with mouse xenograft models of human cancer to study the efficacy of newly developed aptamer-based diagnostics and therapeutics.

Contact supervisor:
Prof. Wei Duan (School of Medicine): wduan@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

This project is subject to final approvals.

Project reference: 1495

Executive function at 4 years of age and subsequent attention deficit disorder

Supervisor/s: Peter Vuillermin

Location: Barwon Health, Geelong

Research centre: CMMR

Project description:

The aim of this project will be to evaluate the relationship between a test of executive function at 4 years of age and a subsequent diagnosis of attention deficit disorder or attention deficit hyperactivity disorder (ADD/ADHD). ADD/ADHD are among the common disorders in Australian children and pose an important social and economic burden. Screening during the preschool years may help identify children who could benefit from intervention prior to commencing school. The project will be a component of the Barwon Infant Study, which is a birth cohort of 1074 infants recruited during pregnancy between 2010 and 2013. The participants completed a test of executive function at the 4 year review. The candidate will evaluate the relationship between the results of this testing and a subsequent diagnosis of ADD/ADHD. The presence of ADD/ADHD will be determined by data linkage to school entry questionnaires. In addition, among a subgroup, the presence of ADD/ADHD will be determined by administration of validated instruments to teachers and parents. The project will involve a contribution to fieldwork in the BIS Primary School reviews. Specifically, the candidate will contribute to approaching the BIS families for consent to participate in this new phase of the study, organising the school visits, administering the many questionnaires and clinical assessments, and data entry. They will receive relevant training and be supervised in these tasks by experienced research staff. The candidate will also be involved in establishing data linkage with the school entry questionnaires. The study will be primarily analytical, involving multivariable regression analyses of quantitative data, with detailed consideration of covariates within a causal epidemiological framework. The candidate will be provided with a suitable level of biostatistical and epidemiological support.

Contact supervisor:
Prof. Peter Vuillermin (School of Medicine): peter.vuillermin@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1494

Understanding eHealth literacy among older adults utilising digital resources to support wellbeing

Supervisor/s: Lesley Berk, Sarah Hosking, Natalie Hyde, Mohamed Abdelrazek, Michael Berk

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

Digital technologies are increasingly used for health information and self-management. These technologies have the potential to improve wellbeing and promote healthy ageing among older adults who are often faced with declining health, social isolation and managing multiple co-morbidities. However, older adults face unique challenges in accessing and effectively utilising health related technology. To positively impact health outcomes in our growing older population, we need to understand the eHealth literacy needs of older adults as well as barriers and enablers to the effective use of websites, apps and devices for health management support.

This project will use a mixed methods approach in the development of guidelines that address ehealth literacy barriers and enablers in digitally assisted wellbeing among older adults.

The project will be informed by an initial systematic review of the literature undertaken by the candidate. However, it is anticipated qualitative data will be collected through focus groups and interviews and analysed using Nvivo software. Quantitative data regarding ehealth literacy, sociodemographic characteristics and health behaviours will also be collected and analysed using statistical software such as SPSS and STATA. The candidate will be supported by a multidisciplinary team of researchers in undertaking the initial systematic review, applying for ethics approval, data collection, analysis and publication.

Contact supervisor:

Dr. Lesley Berk (School of Medicine): l.berk@deakin.edu.au

Suitable for: PhD

Clinical Practice

Project reference: 1488

Implementing best practice non-surgical care for hip and knee osteoarthritis in the Grampians region

Supervisor/s: Anna Wong Shee

Location: Ballarat Health Services

Research centre: Other

Project description:

Knee and hip osteoarthritis (OA) is common, affecting one in 12 Australians, significantly reducing quality of life, and increasing morbidity and health care costs. Osteoarthritis is an Australian National Health Priority Area condition, yet current management of OA is suboptimal and more than two thirds of people with OA report faring badly with their condition. Despite exercise therapy having the strongest evidence base of any available treatment for OA, only 4% of people with OA are referred for this treatment, which has the potential to reduce the need for surgery and to improve outcomes of those who do proceed to joint replacement. People in the Grampians region have a high prevalence of OA and limited access to appropriate care. Ballarat Health Service's Orthopaedic Specialist Clinic has 1890 consumers waiting for assessment, (778 with knee or hip OA) with a wait time up to 1007 days. There is an urgent need for implementation of evidence-based exercise therapies into routine clinical practice.

This project will evaluate the implementation of the Good Living with Arthritis (Denmark) program (GLA:D), a best practice self-management model of care incorporating exercise for people with hip and knee OA, using the Consolidated Framework for Implementation Research (CFIR). The CFIR outcomes for the region will include: barriers and facilitators to implementation of GLA:D and acceptability of the program to health professionals and health services. Patient outcomes will include quality of life, functional measures, pain levels, use of pain medication, sick leave, satisfaction and physical activity levels. Participants will include consumers, allied health professionals, GPs, and orthopaedic specialists.

This project will provide students with an opportunity to develop a range of health service research skills including implementation research skills, the conduct of interviews and focus groups, survey design, qualitative and quantitative data analysis.

Contact supervisor:
Assoc. Prof. Anna Wong Shee (School of Medicine): Anna.WongShee@bhs.org.au

Suitable for: Honours, MPhil

Other considerations:

This project is subject to final approvals.

Project reference: 1487

Optimising allied health care - informed by consumers: a modified Delphi study

Supervisor/s: Anna Wong Shee

Location: Ballarat Health Services

Research centre: Other

Project description:

Victoria's Health and Medical research strategy mission is to 'embed health and medical research into the Victorian health system and accelerate the translation of research findings into clinical practice'. To maximise clinical and patient-centric outcomes from this strategy, priorities for evidence-based practice and research need to be identified. Priorities for evidence-based practice are crucial for allied health professionals in rural and regional areas, who often have limited capacity and capability for research and face unique challenges translating evidence into practice. Consumers are well placed to identify the 'problems' in public health care, particularly those that have had a negative impact on their health and healthcare experiences. Academic researchers have the research and population health expertise and knowledge of critical evidence gaps. Allied health professionals understand clinical practice and barriers and enablers within the public health system. There is a need for a systematic approach that connects academic research with allied health professionals and consumers to define and address the key care delivery issues identified by consumers.

This study aims to identify practice and research priorities to optimise allied health practice in the Grampians region as directly informed by consumers. Firstly, consumers in the Grampians region will be asked about their experiences of allied health care, to identify service gaps and ways to optimize care. Secondly, a modified Delphi survey with consumer representatives, allied health professionals, and researchers will consider consumer findings and form tractable strategies for addressing identified high priority issues.

This project will provide students with an opportunity to develop a range of research skills including the use of a modified Delphi technique, conduct of interviews and focus groups, survey design, qualitative and quantitative data analysis.

Contact supervisor:
Assoc. Prof. Anna Wong Shee (School of Medicine): Anna.WongShee@bhs.org.au

Suitable for: Honours, MPhil

Other considerations:

This project is subject to final approvals.

Project reference: 1481

Optimising medication safety in a rural/regional referral hospital

Supervisor/s: Kevin Mc Namara, David Kong, Renee Dimond, Aaron Fitzpatrick

Location: Waurn Ponds Campus

Research centre: DRH

Project description:

It has been suggested that medication errors or adverse drug events are responsible for ~140,000 hospital admissions in Australia, and is estimated to cost the Australian healthcare system ~$380 million. Indeed, medication errors have an impact on patient morbidity, mortality and healthcare resource consumptions. Accordingly, it is pivotal that efforts are made to minimise the occurrence of medication errors and optimise patient safety. This project will focus on reducing the risk of medication errors and improving patient safety in the hospital setting, primarily at Ballarat Health Services (BHS), which is the only regional hospital for the Grampians region of Victoria. BHS serves a population of approximately 240,000. Opportunities exist for students to gain skills in qualitative and quantitative research methodologies. There may also be opportunities to develop pharmacoeconomic models related to medication errors. This project will generate much needed data to facilitate and support the safe and optimal use of medications in the community and/or hospital settings.

Contact supervisor:
Dr. Kevin Mc Namara (School of Medicine): kevin.mcnamara@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1480

Telehealth in optimising patient care in outpatient specialist clinics

Supervisor/s: Kevin Mc Namara, David Kong, Renee Dimond, Aaron Fitzpatrick

Location: Waurn Ponds Campus

Research centre: DRH

Project description:

Ballarat Health Services is the only regional hospital for the Grampians region of Victoria. It serves a population of approximately 240,000 who are dispersed across 48,646-square-kilometres. Specialist outpatient clinics (e.g. Cardiology Outpatient Clinic) in the region face some challenges in delivering patient-centred care such as timely patient access to the services and increasing demand for the services. The dispersed nature of the population places a considerable burden on many patients in terms of travel time. This project will explore innovative use of telehealth consultation service as a mean of addressing the existing challenges. For example, a telehealth intervention involving an appropriate healthcare professional (e.g. a pharmacist) conducting, for example, a medication review prior to attending the cardiology clinic, to clarify medications and resolve medication issues. Currently these issues consume much of the cardiologist's time during an outpatient clinic appointment. Case conferencing with GPs and cardiologists can be used to resolve issues where possible, thereby avoiding unnecessary patient appointments. The hypothesis is that this intervention might increase access to services by: (1) reduced time spent with the cardiologist, allowing more patients to be seen, and (2) reduced burden of travel for patients attending appointments.
The student may be involved in undertaking an evaluation of the service. This role could involve a mix of process and impact evaluation, to determine the feasibility, acceptability and sustainability of the service, in addition to determining the impact on patient throughput and patient burden of care at the outpatient clinic. A range of program evaluation skills can be developed (e.g. statistical analysis, and qualitative analysis to determine the perspectives of key stakeholders).

Contact supervisor:
Dr. Kevin Mc Namara (School of Medicine): kevin.mcnamara@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1479

Antimicrobial stewardship and optimising the management of infections

Supervisor/s: Kevin Mc Namara, David Kong

Location: Waurn Ponds Campus

Research centre: DRH

Project description:

Antimicrobial resistance is a global threat to human health, with the World Health Organization listing it as a priority issue of our time. Antimicrobial resistance has impact on patient's morbidity and mortality, and costs of delivering healthcare. Inappropriate use of antimicrobials is associated with the emergence of resistance. Thus, antimicrobials should be used and prescribed appropriately. This PhD project will focus on antimicrobial stewardship in hospital- and/or community-based healthcare, and/or rural/regional settings. The student will work with the clinical team to evaluate current or novel approaches to clinical management and prevention of microbial infections in health settings, from a multidisciplinary perspective. The project will be undertaken in collaboration with investigators based at Ballarat Health Services. This project will generate essential data to facilitate the safe, optimal and cost-effective use of antimicrobials. It may be possible for the student to be located in Ballarat.

Contact supervisor:
Dr. Kevin Mc Namara (School of Medicine): kevin.mcnamara@deakin.edu.au

Suitable for: MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1459

Redefining the assessment of the fit of soft contact lenses; a new paradigm

Supervisor/s: Craig Woods

Location: Waurn Ponds Campus

Research centre: Other

Project description:

There are 125 million contact lens wearers worldwide, 95% wear soft contact lenses. The term 'Soft contact lens' is generic and describes this majority of fit due to the apparent soft, moist and flexible nature of this medical device. This softness results in an excellent initial adaptation period to the user in regard to comfort. The flexibility has led to the perception by prescribers of an ease of fit, a perception perpetuated by the manufacturers. Ease of fit has been associated with simplicity of fit and led to the majority of these medical devices to be supplied with the philosophy of 'one fits all' and yet 50% of wearers have their wear impacted within 2 years due to discomfort, lens awareness resulting in reduced use or cessation of wear. Assessing the fit of soft lenses has not changed in the 50 years of their introduction is very subjective in nature and based on minimal information relating to the physical relationship of lens and eye.

New technology offers the opportunity to investigate the fitting performance of soft lenses to a higher, more detailed level and possibly lead to an understanding the impact of the fit has on comfort. The possibility of developing new paradigm on how to assess the fit of these lenses is likely.

This project will investigate the fitting performance of current soft lenses and develop an objective method to assess their fit.

Contact supervisor:
Prof. Craig Woods (School of Medicine): craig.woods@deakin.edu.au

Suitable for: PhD

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

Project reference: 1457

Incidence of dry eye signs and symptoms in a young demographic

Supervisor/s: Craig Woods

Location: Waurn Ponds Campus

Research centre: Other

Project description:

The term dry eye disease (DED) is recognized and defined where by the person has both signs and symptoms related to ocular surface dryness. In its extreme this can be a very debilitating condition and significantly impact a person's quality of life.

The incidence of dry eye disease in the elderly is well understood and exceeds 50% of the population. What is not known is the incidence and risk factors in a young population and the impact on quality of life from DED. With the increasing use of digital devices, sedentary life style and social media demands, incidence and severity of DED in a young population is likely to be significant and ignored by those affected. One significant precursor to dry eye disease is an unstable tear film and current clinical measures are acknowledged to lack both sensitivity and specificity. New clinical technology offers an opportunity to establish measures of tear film stability with controlled variability.

This project will determine the incidence of dry eye disease in a young population and investigate the ideal clinical regimen to measure tear film stability.

Contact supervisor:
Prof. Craig Woods (School of Medicine): craig.woods@deakin.edu.au

Suitable for: PhD

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

Project reference: 1456

Characteristics of contact lenses used to correct ametropia over a 10-year period

Supervisor/s: Craig Woods, Wanda Lam, Philip Morgan, Nathan Efron

Location: Waurn Ponds Campus

Research centre: Other

Project description:

Contact lens are medical devices prescribed and fitted to correct ametropia as an alternative to spectacles by ophthalmic health care providers. Some patients use contact lenses as they are their only option for correction, other preferentially select them and others to manage progressive conditions.

As a global market it is estimated that there are over 125 million wearers, 0.75 million in Australia. Contact lenses can be fabricated from a number of different materials and replaced at a variety of frequencies ranging from daily thru to annually. Globally lens designs and types have changed significantly over the past ten years. Practitioners preferences being influenced by patient needs as well as market forces.

This project will collect survey data from practitioners in Australia and New Zealand relating to patient age and gender; lens material, design, replacement, and wearing modality; weekly wearing frequency; and care system type. Each fit will be weighted relative to the estimated annualized number of fits for the practitioner. Data collected will be reviewed and the contact fitting trends compared to historical data.

Contact supervisor:
Prof. Craig Woods (School of Medicine): craig.woods@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1450

Investigating eye movements in Huntington's disease

Supervisor/s: Amanda Douglass, Larry Abel, Anita Goh, Dennis Velakoulis, Mark Walterfang

Location: Waurn Ponds Campus & Royal Melbourne Hospital, Parkville

Research centre: Other

Project description:

Huntington's disease (HD) is a hereditary progressive neurodegenerative condition, usually beginning in midlife. HD can be diagnosed on the basis of family history and motor symptoms, with progression and severity of the illness generally measured by motor deterioration and detailed neuropsychological assessment of cognition. Predictive genetic testing is also available. Huntington's disease affects a range of systems including cognitive thinking and reasoning, personality, speech and swallowing, and the motor system including involuntary choreiform movements and difficulty walking. These changes result in an increasing lack of independence and need for care, and hastens death. There is no cure.

Gradual atrophy of the basal ganglia (caudate and putamen) due to neuronal loss is the neuropathological and neuroradiological hallmark of HD. This progresses to more generalised cerebral atrophy and reduction of brain weight. This basal ganglia pathology results in the characteristic chorea of HD. As the control of the eye movements is related to the basal ganglia, patients with HD present with impairments in eye movements. Ocular changes have been evident in saccade tasks, slow pursuit, setting a target and anti-saccade tasks. Eye movements have been considered as an indicator of attention and a biomarker for disease progression in other conditions, and this project aims to investigate whether they are a sensitive biomarker for HD symptom progression and new treatments. The aim of this project is to examine eye movements across a hierarchy of tasks in Huntington's disease. This will begin with simple reflexive movements and continue through to examining gaze in tasks known to be impaired in the disease.

Students will be introduced to eye movement analysis including analysis of different saccadic paradigms, scan-paths and dynamic areas of interest.

Contact supervisor:

Dr. Amanda Douglass (School of Medicine): amanda.douglass@deakin.edu.au

Suitable for: MPhil, PhD

Project reference: 1448

Exploration of the effects of teamwork on safety improvement in general practice

Supervisor/s: Andrea Hernan, Kevin McNamara, Vincent Versace

Location: Warrnambool Campus

Research centre: DRH

Project description:

Patient safety in primary care is a growing research area. The rate at which patient safety incidents occur varies, but may be as high as 24 per 100 consultations with an estimated 4% of incidents resulting in patient harm. Some research has been conducted to explore the impact of quality and safety improvement interventions on safety outcomes in primary care. Particularly, teamwork characteristics of primary care staff has been described as a contributing factor towards the success or failure of safety improvement interventions.

The aim of this study would be to explore the effects of teamwork on safety improvement in general practice. This project is one component of a larger study; the 'Patient Measure of Safety in Primary Care: pilot study of an intervention to improve safety in rural Victoria'. The candidate would have access to both quantitative and qualitative data collected during the larger study to answer the research question. The candidate would be required to undertake data manipulation and interpretation and thematic analysis.

Intended outcomes from this project include contribution to the growing evidence base in safety improvement in general practice.

The candidate would be based at the Warrnambool campus and work closely with the investigators at Deakin Rural Health.

Contact supervisor:
Ms. Andrea Hernan (School of Medicine): andrea.hernan@deakin.edu.au

Suitable for: Honours

Project reference: 1447

Exploring the relationship between sleep quality and diabetes control

Supervisor/s: Kevin Mc Namara, Vincent Versace

Location: Waurn Ponds Campus

Research centre: DRH

Project description:

There is increasing evidence of a strong correlation between sleep health and blood sugar control. However, this has not been demonstrated definitively among people with established diabetes or pre-diabetes, nor are there any intervention studies testing the impact of sleep health interventions on blood sugar levels among these individuals. The aim of this project would be to test the hypotheses that (a) there is a causal relationship between the quality of sleep and blood sugar control among people with diabetes/pre-diabetes, and (b) interventions to improve sleep quality for people with diabetes will lead to improved blood sugar control. This project offers an opportunity to be involved in the development, establishment and operation of a new model of industry-based and research collaborative health service.

A key element of our study will be the use of a novel device, integrated with online health management, to allow ongoing patient monitoring of sleep quality and associated health parameters. The device is the first of its kind with assessment capabilities that enables of sleep quality assessment to international diagnostic standards. The proposed study aligns with a range of prevention-focused research projects involving the supervisory team. The student will learn about best practice for patient recruitment, ethics compliance, data collection and analysis for health service trials. You will contribute to the development and evaluation of an intervention to improve sleep quality using the novel diagnostic device and fully integrated health platform, and evaluate the collaborative model of healthcare involving general practitioners, pharmacists and other health professionals. Students will learn a variety of skills relating to conduct of health service trials, project implementation, data collection, statistical analysis and qualitative evaluation.

Contact supervisor:
Dr. Kevin Mc Namara (School of Medicine): kevin.mcnamara@deakin.edu.au

Suitable for: MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1446

The burden of disease and healthcare for older patients with multiple chronic conditions

Supervisor/s: Kevin Mc Namara, Andrea Hernan, Vincent Versace

Location: Waurn Ponds Campus

Research centre: DRH

Project description:

Patients with multiple health conditions (multimorbidity) are increasingly prevalent in health services delivery as our population ages. Our previous research has identified that health services have not been designed to meet their needs, and that there is often a lack of clinical evidence to guide treatment for this group. These patients experience considerable out of pocket expenses to treat their multiple conditions, a significant time and travel burden in attending appointments at multiple health professionals and specialists, conflicting health advice and treatments, increased complexity of self-management, and poor coordination of care. Recent research by supervisors has explored the burden of healthcare on patients, and how it could be improved. This project aims to develop and validate a tool for health professionals to systematically explore the burden on patients associated with healthcare, and to guide a conversation about changes to health management that might improve the patient's quality of life.

You will learn about the challenges faced by patients with multiple health conditions, the difficulties of care coordination, and what doctors and other health professionals could do to better support their needs. The project will help to develop a range of health service skills including the conduct of interviews and focus groups, survey design, participant sampling, ethics processes, and quantitative data analysis using statistical software. Evidence generated from this project will inform important gaps in health service delivery.

Contact supervisor:
Dr. Kevin Mc Namara (School of Medicine): kevin.mcnamara@deakin.edu.au

Suitable for: MPhil, PhD

Project reference: 1445

Improving the quality of preventative cardiovascular care in general practice

Supervisor/s: Kevin Mc Namara, Vincent Versace

Location: Waurn Ponds Campus

Research centre: DRH

Project description:

Cardiovascular diseases (CVD) account for greatest burden of disease among adult Australians. All adults aged 45 years or more are recommended to have a CVD risk assessment, and those identified as being at elevated CVD risk are recommended specific management in guidelines, based on high levels of evidence. Current performance in primary care suggests that only a minority of patients have their risk assessed, and that less than half of high risk patients (without existing disease) are prescribed the recommended lipid-lowering and antihypertensive therapies. The aim of this project will be to explore current practices, and to implement and evaluate interventions to improve the rates of screening and evidence-based management. Working with our partners in general practice, you will have the opportunity to develop skills around organisational change and implementation so that meaningful solutions can be found to address challenges in healthcare. We will use a 'co-design' methodology, which involves engaging stakeholders (patients, practitioners, and practice staff) as partners to inform the redesign of general practice screening services so that it is safer, more effective and more efficient while also emphasising patient-centredness. You will play a critical role in implementing, supporting and evaluating practitioner and patient engagement as part of this co-design approach. It will also involve development of medical record audit or patient surveys, and database analysis, as a means of monitoring stakeholder-focused outcomes that are additional to clinical outcomes. Analysis of such processes typically involve a mixed methods approach, which will include learning to use qualitative analytical methods (e.g. to conduct and analyse interviews and focus groups) and supplemented by quantitative analysis using statistical software.

Contact supervisor:
Dr. Kevin Mc Namara (School of Medicine): kevin.mcnamara@deakin.edu.au

Suitable for: MPhil, PhD

Project reference: 1443

MRI magnetic field exposures to clinical staff, patients and the public

Supervisor/s: Giovanni Mandarano, Peter Riley, Paul Yielder

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Magnetic Resonance Imaging (MRI) is now a commonplace modality which exposes clinical staff, patients and members of the public to magnetic field strengths which are tens of thousands of times more intense than terrestrial magnetism (< 1 Gauss). There is very little information available on the relative exposures of these groups, primarily due to the lack of individual personal dosimeters which can be worn unobtrusively.

The purpose of this project is to deploy newly developed research-grade personal dosimeters, which acquire a digital measurement of magnetic field intensity varying with exposure time. The integrated dose below the exposure-time curve will give a very accurate profile of individual exposures.

In this project, the student will work with Deakin Medical Imaging stakeholders offering MRI services to organize, undertake and analyze the exposure data in such a manner to ensure good statistical reliability. This data will be matched to research data relating to established biological effects arising from exposure to static and dynamically varying magnetic fields. On the basis of these findings the student will propose safety recommendations or protocols to ensure best practices in accord with current and possible future legislation.

Contact supervisor:
Assoc. Prof. Giovanni Mandarano (School of Medicine): giovanni.mandarano@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1416

Examining colour vision requirements for firefighters viewing fire control panels

Supervisor/s: Amanda Douglass, John Parkes

Location: Waurn Ponds Campus

Research centre: Other

Project description:

Colour vision is an important part of many occupational tasks. Some tasks are safety critical and, if the incorrect colour judgement is made, may in result in serious safety consequences. One of the safety critical tasks of a metropolitan fire fighter upon callout to a fire alarm in a large building is to examine the building's fire control panel in order to determine which area alarm has been triggered. Fire control panels have arrays of unlit lights and can be quite large. The task is to identify the single, small, red light that indicates the location of the burning compartment.

Colour vision deficiency can result in a reduced capability to detect specific colours of light, making it difficult to see when, or indeed if, these lights are lit. Colour vision testing uses traditional colour matching tests, often designed for other tasks, in order to determine a person's degree of colour deficiency. Newer computerised colour vision tests have recently become available. We do not, however, have information linking performance on these tests to most real world occupational tasks.

This project will involve characterising the range of lights in use on fire control panels in regards to their colour composition and luminance. Comparisons will then be made between the performance of a range of participants with different levels of colour vision deficiencies and controls to detect lights on representative fire control panels and their performance on a range of colour vision tests. This would assist in the setting of appropriate colour vision standards for firefighters.

Students will be introduced to colour vision classification and use this to design a task to mimic firefighter panels on which a range of participants with different colour vision deficiency levels will be tested. Students will need to determine the appropriate statistics for their task, and will be encouraged to think about how occupational standards are determined.

Contact supervisor:

Dr. Amanda Douglass (School of Medicine): amanda.douglass@deakin.edu.au

Suitable for: MPhil, PhD

Project reference: 1408

Empowering consumer scientists - evaluation of a community-based peer support group

Supervisor/s: Olivia Dean, Linda Byrne

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

The treatment of mental disorders has always been highly individual but more and more patients are being empowered to seek treatments that are most suitable for their own experience of mental illness. Simultaneously, the consumer movement has taken great leaps in presenting evidenced-based information to people who are experiencing mental disorders. IMPACT TRIALS is committed to assisting the consumer movement to enhance the empowerment of patients and to better tailor treatments based on the needs of the people with these disorders. We have been working with a peer-led support service, This Is My Reality, to form bridges between consumer groups and research activities. The current project is borne out of this relationship.

The project involves the evaluation of a peer-support program for people with bipolar disorder. The groups are led by a consumer and have a focus on evidence-based content. The Director of This Is My Reality is seeking to enhance the rigour and applicability of the program by including some evaluation pre- and post-program. We are seeking a student that has an interest in consumer-focused research to assist lead the evaluation. The evaluation will require the student to identify (with guidance) and appropriate measure to capture data at the commencement and end of the support group sessions. This data will be collated and statistics will be applied to pre- and post-group analyses. Further, some qualitative notes may be captured to richen the data.

This project spans both the School of Medicine and the School of Psychology research focus. The project will not only provide scientific outcomes, but will also directly further consumer-led research (in the vein of the citizen scientist program).

Contact supervisor:
Dr. Olivia Dean (School of Medicine): o.dean@deakin.edu.au

Suitable for: Honours, MPhil

Other considerations:

This project is subject to final approvals.

Project reference: 1397

Is emergency surgery a good opportunity to encourage smoking cessation for patients who smoke?

Supervisor/s: Seetal Dodd, Douglas Stupart, Lauren Arancini

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

A medical emergency requiring emergency surgery may be an important opportunity to encourage tobacco smokers to quit. Advice from a surgeon to quit smoking, the need for surgery, and the medical environment, can be powerful motivating factors. Patients are not permitted to smoke anywhere on hospital grounds. Patients who have emergency surgery attend a surgical clinic post-surgery with their final visit to the surgery clinic typically 3-months post-surgery. Smokers will be identified post-surgery and given quit advice by their surgeon and contact details for quit support. Smoking characteristics will be measured at 3 month post-surgery using the Fagerström Test for Nicotine Dependence to assess the intensity of physical addiction to nicotine and a 'Smokerlyser' to measure exhaled carbon-monoxide. Pre-surgery smoking behaviours will be investigated by face-to-face interview with data collected from the patient's self-report. Patient characteristics will be collected from hospital case files. The honours student will collect data, calculate rates of quitting, and investigate patient characteristics associated with successful quitting.

Contact supervisor:
Assoc. Prof. Seetal Dodd (School of Medicine): seetald@barwonhealth.org.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1396

An investigation of smoking cessation outcomes for patients who smoke and have elective surgery

Supervisor/s: Seetal Dodd, Douglas Stupart, Lauren Arancini

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

About 30% of patients who have elective surgery at University Hospital Geelong (UHG) are tobacco smokers. Advice from a surgeon to quit smoking, the need for surgery, and the medical environment, can be powerful motivating factors to help a smoker to quit. Patients who have elective surgery attend a surgical clinic prior to surgery and post-surgery, with their final visit to the surgery clinic typically 3-months post-surgery. Smokers will be identified prior to surgery and given quit advice by their surgeon and contact details for quit support. Smoking characteristics will be measured at pre-surgery and 3 month post-surgery using the Fagerström Test for Nicotine Dependence to assess the intensity of physical addiction to nicotine and a 'Smokerlyser' to measure exhaled carbon-monoxide. Patient characteristics will be collected from hospital case files. The honours student will collect data, calculate rates of quitting, and investigate patient characteristics associated with successful quitting.

Contact supervisor:
Assoc. Prof. Seetal Dodd (School of Medicine): seetald@barwonhealth.org.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Immunity

Project reference: 1490

Role of extracellular vesicles during pathogenesis of malaria

Supervisor/s: Tania De Koning-Ward, Poshmaal Dhar

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Malaria is a vector-borne disease caused by Plasmodium parasite, which is primarily seen in tropical and sub-tropical countries. Despite the availability of anti-malaria drugs and consistent efforts to control the spread of the vector, this illness remains endemic in nearly 91 countries worldwide (WHO, 2017).

Infection with the malarial parasite clinically manifests as mild to severe disease forms, depending on the interplay of host and parasite-associated factors. Severe disease results in complications such as anaemia, respiratory and gastrointestinal distress and cerebral malaria. The involvement and significance of extracellular vesicles (EVs) during malaria infection in humans has recently become evident. These EVs are bi-lipid membrane spheres that are released both by the parasite and infected human cells. These extracellular vesicles carry protein, lipids and nucleic acids, serving as delivery cargo for parasite-associated molecules. It has been demonstrated that these vesicles perform three primary functions during malarial pathogenesis: 1) stimulate host immune responses, 2) assist in cell-cell communication and 3) promote parasite gametocytogenesis. Due to their critical role at the host-pathogen interphase, this project has been designed to understand the mechanism of how these EVs modulate immune responses, primarily in macrophages and dendritic cells (key mediators of innate immunity).

For this project, a wide variety of techniques will be employed, including culturing of malaria parasites and EV, co-culture assays of parasite and EV with human cell-lines, molecular biology techniques, immunoassays and flow cytometry.

Contact supervisor:
Dr Poshmaal Dhar (School of Medicine): posh.dhar@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1484

Effect of contact lens wear on the ocular surface in ocular allergy

Supervisor/s: Moneisha Gokhale, Serap Azizoglu, Cenk Suphioglu

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Project description: It has been estimated that 1 in 5 Australians have at least one form of an allergic condition and ocular symptoms are estimated to be present in 40-60% of this allergic population. Itching is the main symptom of ocular allergy, which leads to the mechanical motion of eye rubbing. Eye rubbing for 30 mins has shown to significantly decrease corneal thickness. Constant eye rubbing in ocular allergies is associated with changes to the corneal shape, leading to the development of a condition called Keratoconus. Further, 'eye rubbing' is shown to be significantly more prevalent in contact lens wearers than non-lens wearers. Contact lens wear is contraindicated if there are apparent clinical signs of ocular allergy detected, such as papillae under the lids and redness on the ocular surface. In the absence of these signs, contact lenses are frequently worn. Contact lens wear and the mechanism of eye rubbing are shown to be two of the extraneous processes that can cause corneal micro injuries and release of inflammatory biomarkers on the ocular surface. The current more sensitive techniques may enable us to evaluate ocular allergy via levels of tear film biomarkers and changes to corneal shape via confocal microscopy in subclinical cases. This will provide a better understanding of the impact of contact lens wear in patients with subclinical levels of ocular allergy. Thus, this study is proposed to evaluate the effect of contact lens wear on corneal structure (dendritic cells and corneal epithelial sub basal nerve plexus) and tear film biomarkers in contact lens wearers with a history of ocular allergy, which forms the overall aim of this project.

Techniques involved: Confocal microscopy, allergy symptoms questionnaire, biochemical assays of tears.

Contact supervisor:
Dr. Moneisha Gokhale (School of Medicine): moneisha.gokhale@deakin.edu.au

Suitable for: Honours

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

This project is subject to final approvals.

Project reference: 1483

Understanding the role of miRNAs in influenza virus immunity

Supervisor/s: John Stambas, Daniel Dlugolenski

Location: CSIRO (Australian Animal Health Laboratory), Geelong

Research centre: CMMR

Project description:

In 2009, the emergence of pandemic swine-origin H1N1 influenza virus highlighted to the scientific community and to governments worldwide, the ongoing, unpredictable and very real threat influenza viruses pose to human health. Improving current live vaccine strategies is critical to ensure adequate protection for future pandemics. This project will use cutting edge technology, known as reverse genetics to insert microRNA (miRNA) sequences into influenza viruses in order to investigate the development of immune cell populations. MiRNA are short RNA molecules ~18-22 nucleotides in length that regulate expression of many genes at a post-transcriptional level by inhibiting the translation of messenger RNA (mRNA) to protein. They achieve this by binding to mRNA through the RISC complex causing either degradation of the mRNA (if a perfect complementary sequence) or inhibition (if an imperfect complementary sequence). This regulation of gene expression is believed to be involved in the development and physiology of all eukaryotes. By inserting our miRNAs of interest into the virus itself for delivery to the host, we aim to more efficiently eliminate virus following infection. The student will be generating viruses and validating their function in vitro and in vivo.

Techniques: Cell culture, virology, molecular biology, immunology, flow cytometry, tetramer staining, intracellular cytokine staining.

Contact supervisor:
Assoc. Prof. John Stambas (School of Medicine): john.stambas@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1475

Function of the ADAMTS-15 protein in development

Supervisor/s: Alister Ward, John Stambas

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Background:

The A Disintegrin-like and Metalloproteinase with Thrombospondin Type-1 Motifs (ADAMTS) family of metzincins are secreted proteins that have diverse functions during development. The hyalectanases (ADAMTS-1, 4, 5, 8, 9, 15 and 20) are a subset of this family that have enzymatic activity against hyalectan proteoglycans. These represent key components of the extracellular matrix (ECM), the remodeling of which is essential for normal development as well as being implicated in a range of diseases.

Project aims:

A number of studies have defined crucial roles for several of the hyalectanases, but the function of ADAMTS-15 remains poorly characterized. This project takes advantage of newly developed zebrafish mutants of ADAMTS-15 to investigate for the first time its effects on development, and to explore its interaction with other family members and potential hyalectan substrates.

Summary of techniques to be used:

This Project will analyse zebrafish pre-existing adamts15 mutants by a range of molecular and cellular methodologies. It will focus on investigating the development of key organs through imaging, gene expression analysis and functional assays.

Contact supervisor:

Prof. Alister Ward (School of Medicine): award@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1474

Control of early blood and immune cell development: role of Ikaros transcription factors

Supervisor/s: Alister Ward, Clifford Liongue

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Background:

Members of the Ikaros family of zinc finger transcription factors are important for immune system development, via their effects on key genes involved in this process. Perturbation of these transcription factors can lead to various diseases, particularly lymphomas and leukemias. However, relatively little is known about the function of two members of this family, Eos and Pegasus.

Project aims:

Studies in our laboratory and elsewhere have suggested that the various family members interact in a variety of both synergistic and antagonistic ways, which may be very important in disease. The aim of this Project is to investigate the role of Eos and Pegasus in blood and immune development through the analysis of specific zebrafish eos and pegasus mutant lines, coupled with investigation of the genes regulated by these proteins and the other family members with which they interact.

Summary of techniques to be used:

This Project will use a range of molecular, cellular and developmental biological approaches. It will take advantage of specific mutants generated by genome editing and explore the impact of these mutants on development using imaging, whole-mount in situ hybridisation and functional assays coupled with transcriptional and biochemical studies.

Contact supervisor:

Prof. Alister Ward (School of Medicine): award@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1472

Role of cytokine receptor signaling in development and disease

Supervisor/s: Alister Ward, Clifford Liongue

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Background:

The correct development and maintenance of multi-cellular organisms is supported by systems enabling cells to communicate to one another in response to distinct cues. Cytokines are polypeptides that are produced and secreted by cells following a variety of stimuli, and induce a range of cellular effects via specific cytokine receptors located on the cell surface. These receptors signal to the nucleus via the so-called 'JAK-STAT-SOCS' signaling pathway to mediate effects on gene transcription and cell physiology that are particularly important in blood and immune cell development. Perturbation of this pathway is associated with several diseases, including inflammation and cancer.

Project aims:

This Project aims to further our understanding of the Cytokine receptor-JAK-STAT-SOCS pathway at the molecular level, as well as elucidating how changes in this pathway lead to disease, particularly cancer. This approach will provide insight into the underlying biology as well as establishing a platform for the development of therapeutics to combat relevant diseases.

Summary of techniques to be used:

This Project will use sophisticated molecular and cellular approaches in zebrafish to investigate the role of one or more components of the Cytokine receptor-JAK-STAT-SOCS pathway. It will take advantage of specific mutants generated by genome editing and explore the impact of these mutants on development using imaging, whole-mount in situ hybridisation and functional assays.

Contact supervisor:
Prof. Alister Ward (School of Medicine): award@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1439

Analysis of DNA methylation in human stools: towards a systems-based approach to human gut health

Supervisor/s: Jeffrey Craig, Amardeep Dhillon

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

The rapidly-developing field of microbiome research has shown that dietary intake can influence gut microbiome complexity and that this can in turn influence health. This in turn will influence the composition of gut metabolites, many of which are epigenetically active. However, single 'omic' studies can tell us only so much about diet- and health-associated changes to our biology, and increasingly, animal studies are using multi-omic approaches. However, very few such human studies exist. This study will add one piece of the puzzle by developing robust protocols to analyse DNA methylation in human stool samples. Samples will be taken from an established human cohort and from existing mouse studies. For both human and mouse components, ethics are in place and samples have been collected. In addition, previous students have performed a proof of principal and established a basic protocol that the Honours student can further develop and expand upon. This project will have a lab-based and a literature review component. Techniques used will include DNA extraction from human and mouse stool samples, PCR, and DNA methylation analysis technologies, potentially via next generation sequencing. This is an ideal project for a student who is good at problem solving and is keen on pushing boundaries.

Contact supervisor:
Assoc. Prof. Jeffrey Craig (School of Medicine): jeffrey.craig@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

This project is subject to final approvals.

Project reference: 1413

Identifying innate immune cells and their regulation in zebrafish

Supervisor/s: Clifford Liongue, Alister Ward

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Pathogens represent a constant challenge to maintaining health, with the first line of defence being the innate immune system. Key components of this system are the white blood cells called neutrophils and macrophages. Neutrophils are the 'first-responders' and serve to 'seek and destroy' pathogens by a variety of mechanisms, typically dying in the process. Macrophages, on the other hand, arrive later and carry out a range of functions, including phagocytosis and coordination of an appropriate immune response. Neutrophils and macrophages are controlled by a network of cytokines, which represent key mediators of cell to cell communication, such as from an infected cell to a neutrophil or macrophage or from a macrophage to other immune cells. Zebrafish represents a powerful experimental model for understanding development and disease, which we and others have used to better understand the immune system and its control. The aim of this project is to investigate neutrophil and macrophage functions in this model, and especially its regulation by cytokine receptor signaling.

Summary of techniques to be used:

This project will utilise cutting-edge techniques to directly image and study live zebrafish macrophages and neutrophils responding to immune challenges. This includes use of a customised range of zebrafish knockout and transgenic lines coupled with fluorescent activated cell sorting, confocal microscopy and molecular biology techniques.

Contact supervisor:
Dr. Clifford Liongue (School of Medicine): c.liongue@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1412

Role of the Stat5 transcription factor in development and disease

Supervisor/s: Clifford Liongue, Alister Ward

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Background:

The Signal Transducer and Activator of Transcription (STAT) family of transcription factors represent a paradigm for how extracellular signals (in the form of cytokines and growth factors) can rapidly be converted into changes in gene transcription. Amongst these, the STAT5 proteins have been shown to act downstream of a diverse range of factors, where they regulate genes in both a positive and negative manner to impact on important processes such as proliferation, survival and differentiation. In this way, STAT5 proteins have been implicated in both normal development, as well as its disruption in diseases, including leukaemias, lymphomas and other blood cell disorders. They are controlled by a number of regulators that serve as a 'brake' to negatively regulate signaling through this pathway.

Project aims:

The aim of this Project is to use an array zebrafish mutants to investigate the role of STAT5 in the development of blood and immune cells, and to assess its negative regulation in vivo.

Summary of techniques to be used:

This Project will utilise a range of cellular and molecular approaches, such as fluorescent activated cell sorting and CRISPR mediated genome editing to create and exploit the power of customised zebrafish transgenic and knockout lines.

Contact supervisor:

Dr. Clifford Liongue (School of Medicine): c.liongue@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1402

Extracellular ADAMTS enzymes: are they important for influenza virus immunity?

Supervisor/s: John Stambas, Daniel Dlugolenski

Location: CSIRO (Australian Animal Health Laboratory), Geelong

Research centre: CMMR

Project description:

Influenza viruses are responsible for high rates of morbidity and mortality worldwide. Prophylaxis can be obtained through seasonal vaccination or via administration of antivirals (tamiflu or relenza) that target the neuraminidase expressed on the surface of the virus. Although effective use requires prior knowledge of circulating strains, a 6 month lag period for vaccine production and in the case of anti-virals lack of resistance, is required. Therefore, targeting the host may be a more effective method by which influenza epidemics and pandemics can be controlled prior to the vaccine production.

Our lab was the first to identify the importance of two extracellular matrix 'A Disintegrin-like and Metalloproteinase domain with Thrombospondin-1 repeats' (ADAMTS) metalloproteinases, "ADAMTS7" and "ADAMTS5" in influenza virus pathogenesis. Our preliminary data suggests that host cell expression of ADAMTS5 and ADAMTS7 is essential for efficient clearance of the virus. The aim of this proposal is to investigate, extend and further elucidate the highly novel contribution of the extracellular matrix and its remodelling enzymes, ADAMTS5 and ADAMTS7 to influenza virus pathogenesis and immunity. The honours student will be examining the kinetics of enzyme expression following infection and will identify enzyme expression in various immune cell populations.

Techniques to be used: cell culture, virology (virus amplification, plaque assay, HA assays), flow cytometry, immunology, RT-PCR, molecular biology.

Contact supervisor:
Assoc. Prof. John Stambas (School of Medicine): john.stambas@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1401

CISH and its role in influenza virus infection

Supervisor/s: John Stambas, Daniel Dlugolenski

Location: CSIRO (Australian Animal Health Laboratory), Geelong

Research centre: CMMR

Project description:

Influenza A virus (IAV) and pneumonia related deaths (55,227/ year USA) rank in the top 10 leading causes of death annually. The virus is responsible for over 200,000 hospitalizations in the United States and has wide-ranging socio-economic effects. The financial burden associated with IAV in the United States amounts to $87.1 billion USD annually. Currently, licensed therapeutics for IAV exhibit low efficacy and have a short window for administration to be effective. IAV-specific therapeutics target viral components that results in high rates of mutation and drug resistance. As such, therapeutics that target host machinery are ideal for the development of an efficacious drug with a reduced likelihood of resistance. Disease intervention strategies that enhance T cell responses may provide a viable platform for drug development with high efficacy and limited drug resistance.

Cytokine-inducible SH2-containing protein (CISH) is member of the SOCS family of proteins that form part of a classical negative feedback system regulating cytokine signal transduction. Single nucleotide polymorphisms in the promoter of the human Cish gene have been found to correlate with enhanced susceptibility to infectious diseases including bacteraemia, Tuberculosis, malaria, Cryptosporidium parvum, Toxoplasma gondii, hepatitis B virus and respiratory syncytial virus infection in humans and mice. Therefore, CISH may play a significant role in a variety of phylogenetically distinct pathogenic infections ranging from multicellular organism to viruses. The honours student will be performing in vitro and possibly in in vivo experiments to understand the role of CISH during influenza virus infection. The aim of the project is to elucidate the multi-functional role of CISH and to provide evidence for positive and negative regulation of T cell responses in order to uncover novel targets for disease intervention.

Techniques: Molecular biology, virology, immunology

Contact supervisor:
Assoc. Prof. John Stambas (School of Medicine): john.stambas@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1496

Dissecting how malaria parasites regulate gene expression

Supervisor/s: Tania de Koning-Ward

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Histone acetylation and chromatin remodeling is a major mechanism by which gene activity is determined. In Plasmodium falciparum, the infectious agent responsible for the devastating disease malaria, histone acetylation and chromatin remodeling are crucial for parasite survival and gene regulation. Bromodomain proteins (BDPs) are proteins that bind histone acetylations, translating the "histone code" into altered gene expression. Conditional knockdown of one of the eight BDPs in P. falciparum has shown that BDP1 is essential for invasion of erythrocytes and thus is critical for blood-stage parasite survival, yet the role of the remaining BDPs in the malaria lifecycle have not be determined. Chromatin remodeling enzymes are also present in P. falciparum but their contribution to gene expression has yet to be established. Given that bromodomains proteins and chromatin remodeling enzymes are novel drug targets in HIV, cancer, and inflammation, understanding how they contribute to regulation of gene expression in malaria parasite may reveal whether they represent a new class of drug targets for anti-malaria therapy. The role of the various BDPs and remodeling enzymes in P. falciparum will be undertaken by epitope tagging the genes to determine their localization. Conditional knockdown of their expression in both human parasites will be undertaken to determine the impact on parasite growth throughout the malaria lifecycle and the effect on the expression of genes involved in invasion, host cell remodeling, gametocytogenesis and other pathways that are critical to the malaria parasite.

The project will involve using the most cutting edge molecular biology techniques to engineer malaria parasites to knockdown protein expression. The student will also gain experience in a diverse number of techniques, including parasite and cell culturing, protein analysis, imaging techniques (immunofluorescence) and if time permits, RNA sequencing.

Contact supervisor:

Prof. Tania de Koning-Ward (School of Medicine): taniad@deakin.edu.au

Suitable for: Honours, MPhil

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

Project reference: 1491

The role of ADAMTS in malaria pathogenesis

Supervisor/s: Tania de Koning-Ward, John Stambas

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Malaria is a disease of global significance, with 216 million cases reported in 2015, of which ~440,000 infections were fatal. The disease is caused by infection with parasites belonging to the genus Plasmodium. Severe malaria occurs when the infection becomes complicated by serious organ failure or abnormalities in the patient's blood or metabolism Understanding why some people are more at risk from developing severe disease is crucial to development adjunct therapies to reduce the fatality rates. One family of proteins that could determine the risk of developing severe disease is the ADAMTS (extracellular matrix structural proteins) family that contains 19 members. Indeed, reduction in plasma ADAMTS 13 activity has been associated with increased susceptibility to cerebral malaria as a result of binding of Plasmodium-infected red blood cells to the endothelium in brain post-capillary venules. In contrast, our preliminary studies using ADAMTS7 knockout mice, indicate that reduction of this ADAMTS leads to protection for cerebral malaria, potentially via prevention of pro-inflammatory immune responses that are important contributors of disease.

This project will utilize ADAMTS knockout mouse models to characterize the role that ADAMTS enzymes play in the pathogenesis of malaria infection, with the goal of developing novel therapeutics to reduce severe disease.

Techniques to be used: Parasitology, mouse infection studies, flow cytometry, histology, immunology

Contact supervisor:
Prof. Tania de Koning-Ward (School of Medicine): taniad@deakin.edu.au

Suitable for: Honours, MPhil

Infection

Project reference: 1429

Mycobacteria ulcerans (buruli ulcer) genomics, ecology and epidemiology

Supervisor/s: Eugene Athan, Daniel O'Brien

Location: Barwon Health, Geelong

Research centre: CMMR, GCEID

Project description:

Research program: Buruli ulcer is the third most common Mycobacterial disease in humans. Although usually common in Tropical regions it has become increasingly reported in coastal Victoria. It causes a devastating destructive skin and soft tissue disease in humans. The exact ecology and transmission to humans remains unknown. We are a multidisciplinary research team including basic genomic scientists, environmental scientists, public health specialists, epidemiologists and expert clinicians. We are currently undertaking detailed environmental and epidemiologic studies including possible animal and insect vectors to identify likely modes of amplification and transmission.

Depending on the type of student, this project will involve:

Honours student

- Geographic information system analysis including weather, rainfall, seasonality and land development associated with all cases identified in Victoria
- Epidemiological and clinical analysis of large patient cohort
- Genotyping of strains

PhD student

- Microbiological laboratory analyses of isolates and therapy
- Serosurvey of human population
- Study of potential animal reservoirs
- Geographic information system analysis including weather, rainfall, seasonality and land development associated with all cases identified in Victoria

Contact supervisor:
Prof. Eugene Athan (Barwon Health): e.athan@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1427

Medical device and biofilm infections: pathogenesis, genomics and epidemiology

Supervisor/s: Eugene Athan, Richard Page

Location: Barwon Health, Geelong

Research centre: CMMR, GCEID

Project description:

Research program: medical device and prosthesis are increasingly used worldwide to improve the quality of life. Infections of these devices are complex and costly to manage often necessitating complete removal. The development of Biofilm in device infections is characteristic and reduces the effectiveness of host immune response and antimicrobial therapy. We are studying biofilm characteristics both in vitro and soon in vivo systems to better understand pathogenesis, targets for therapy and trial of preventative approaches. We are also developing detailed prospective databases and a tissue bio-bank of established biofilm infections. We propose detailed clinical, epidemiological and microbiological analyses of all cases of orthopedic infections including biofilm studies in vitro.

The project will involve:

- Detailed analyses of clinical cases with cardiac or orthopedic prosthetic infections (PJIs)
- Microbiological analyses of isolates causing infections including biofilm studies

The student will perform laboratory work on all cardiac or prosthetic joint infections seen at Barwon Health which will include biomarkers, cultures and antibiotic resistance assays MICs. The student will also assist in clinical data collection including long term outcomes.

Contact supervisor:

Prof. Eugene Athan (Barwon Health): e.athan@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1424

Staphylococcus aureus infections and endocarditis: pathogenesis, genomics and epidemiology

Supervisor/s: Eugene Athan

Location: Barwon Health, Geelong

Research centre: GCEID

Project description:

Research program: Staphylococcus aureus infections are increasingly globally. Both community acquired and Health care associated infections pose a major threat to human health. Blood stream infections have a wide spectrum of disease manifestations. The host pathogen relationship is poorly understood. S. aureus has a complex array of virulence and adherence factors resulting in tissue invasion, metastatic spread and fulminant septic shock. The mortality rate is over 10% despite optimal medical therapy. Increasing reports of antibiotic resistance are of great concern. We have established a detailed prospective epidemiologic cohort of all adult patients with SAB (>200) at University Hospital Geelong and Alice Springs Hospital. We are performing whole genome sequencing of all isolates and extensive phenotypic studies in order to better predict disease severity. We are also studying common biomarkers to assist with disease prognosis. We would like to better understand the microbiological and epidemiological features of all cases of infective endocarditis. Laboratory typing of isolates will also be performed.

The project is a detailed epi and clinical analysis of all cases of IE seen at Barwon Health over last 15 years (data set is already in place).

Honours will review retrospective clinical case files and perform simple lab tests of isolates already stored. PhD students will collect detailed clinical and microbiology data sets as well as some genomics. Techniques used include collection of microbiological isolates and analyses of all cases of IE risk factors and patient outcomes.

Contact supervisor:

Prof. Eugene Athan (Barwon Health): e.athan@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1423

The epidemiology of rotavirus in Australian pigeons

Supervisor/s: Soren Alexandersen, Anthony Chamings

Location: Barwon Health, Geelong

Research centre: CMMR, GCEID

Project description:

Background
Rotaviruses have been identified as a causative agent of diarrhoea in many species including humans, cattle, pigs, horses, chickens and turkeys. In May 2016, a novel rotavirus was the cause of cases of diarrhoea and significant mortality in pigeon lofts in Western Australia. The virus was subsequently detected in similar outbreaks in the eastern states and South Australia by December 2016. The source of the rotavirus is currently unknown, although a report of mortalities in a flock of wild pigeons in Western Australia was made around the time of the first outbreak. It is therefore possible that this virus naturally circulates in wild pigeons and has crossed into susceptible captive populations.

Aims
The aim of this project is to better understand the epidemiology of avian rotaviruses in Australia by looking for evidence of rotaviruses in the droppings of wild pigeons. Knowledge generated from this project will help state government agricultural departments understand the current distribution of the virus, model future outbreaks and could guide future recommendations for disease control measures.

Outline
The student will first design and test a real time PCR capable of detecting avian rotaviruses. The student will then collect and test wild and feral pigeon faeces using their new assay. If positive samples are found, the student will genetically sequence this virus and compare it to the known sequences of other avian rotaviruses.

Skills and knowledge
This project will introduce the student to basic molecular techniques and help them understand the principles of disease surveillance. Skills obtained in this project would be invaluable to students considering careers in the fields of public health, disease diagnosis, veterinary medicine or environmental monitoring.

Contact supervisor:
Prof. Soren Alexandersen (School of Medicine): soren.alexandersen@deakin.edu.au

Suitable for: Honours

Project reference: 1422

Zoonoses burden of disease

Supervisor/s: Eugene Athan, Soren Alexandersen, John Stenos

Location: Barwon Health, Geelong

Research centre: GCEID

Project description:

The majority of emerging infectious disease threatening human health are spill over events from animal infections including companion animals such as cats and dogs. These are known as zoonotic diseases. The impact of such infections in humans has not been well characterised in Victoria or Australia. The Geelong region has a stable population very representative of much of Australia. It is ideally suited for epidemiologic studies and can provide estimates of incidence for populations at risk per annum for rare and common infectious diseases. We have a formal collaboration with the Australian Rickettsial Reference laboratory which performs diagnostics for Coxiella infections. Utilising laboratory and state department of health surveillance data for notifiable zoonotic diseases we propose a study to estimate burden of disease for Coxiella Burnetti, Psitacossis, Leptospirosis, Invasive Pasteurella multocida, Capnocytophagia canimorsis and Bartonella Henslae infections in our population. We will describe clinical manifestations and outcomes of all reported cases.

Students will undertake case collection from existing clinical and public health databases. They will use quantitative analysis to describe and analyse clinical disease, risk factors and outcomes for some zoonotic infections.

Contact supervisor:
Prof. Eugene Athan (Barwon Health): e.athan@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1421

Prevalence and characterization of Coronaviruses in wild birds

Supervisor/s: Soren Alexandersen, Anthony Chamings, Jason Hodge

Location: Barwon Health, Geelong

Research centre: CMMR, GCEID

Project description:

Coronaviruses (CoVs) include zoonotic viruses with a broad host range that may be transmitted from animals to humans. Four genera, Alpha-, Beta-, Delta- and Gammacoronavirus, are included in the Coronavirinae subfamily of the Coronaviridae family. The Alpha-CoV and Beta-CoV include human/zoonotic pathogens that cause mild to severe disease in humans, including SARS (severe acute respiratory syndrome) and MERS (Middle East respiratory syndrome) as well as in animals, e.g. porcine epidemic diarrhea (PED). Bats are thought to be the originating source of Alpha- and Beta-CoVs, while Gamma-CoV, e.g. infectious bronchitis virus in poultry, and the relatively newly discovered Delta-CoVs are thought to have originated in birds. A recent study found presence of Beta- and Delta-CoVs in birds genetically similar to some found in mammals. The presence of CoVs in birds is not well understood, yet given the risk of interspecies transmission and host-switching, knowledge of distribution among birds could be significant in predicting or assist in preventing the emergence of novel infections. Thus, this project will identify the status of CoVs in wild birds using advanced molecular techniques.

Swab or fecal samples from wild birds will be analysed using RT-PCR for the presence of Coronaviruses. Positive samples will be sequenced to allow for comparison with other identified CoV gene sequences. The project will be done in conjunction with the Centre for Integrative Ecology, and will use samples already collected from ongoing projects on the ecology and behavior of wild birds. The project will provide experience in a range of molecular techniques, including RNA/DNA extraction, cDNA preparation, PCR, next generation sequencing, bioinformatics and ecological analyses. CoV sequences and their host origin will be compared with the current knowledge of host species to provide better understanding of emerging infectious disease.

Contact supervisor:
Prof. Soren Alexandersen (School of Medicine): soren.alexandersen@deakin.edu.au

Suitable for: MPhil, PhD

Project reference: 1414

Investigating how anti-malaria drugs enter parasitised red blood cells

Supervisor/s: Tania de Koning-Ward, Natalie Counihan

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Malaria is one of the most significant infectious diseases worldwide, with the clinical stages of the disease caused by infection of red blood cells (RBCs) with Plasmodium parasites. Upon infection of RBCs, Plasmodium induces channels in the RBC membrane, altering the permeability of the RBC so that the parasite can gain access to vital nutrients in the host serum required for its survival. Whilst many anti-malaria drugs can passively transfer across the RBC membrane, some drugs have been shown to require the Plasmodium-induced channels to enter. The aim of this project is to investigate which drugs enter via the Plasmodium-induced channels and what the molecular makeup of these channels are. This information is critical in determining whether Plasmodium parasites can develop resistance to certain classes of drugs by preventing their uptake through these channels. To address these aims, we have genetically engineered a parasite line in which the expression of a parasite protein (termed RhopH2) that contributes to RBC permeability can be reduced. The impact this has on the uptake of different classes of drugs and hence parasite survival will be analysed. This project will also examine whether other proteins that interact with RhopH2 are also critical for changing the permeability of RBCs.

For this project, a wide variety of techniques will be employed, including culturing of malaria parasites (cell culture and parasitology methods), drug-dose response assays, protein, cellular and molecular biology techniques will be employed.

Contact supervisor:
Prof. Tania de Koning-Ward (School of Medicine): taniad@deakin.edu.au

Suitable for: Honours

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

Project reference: 1493

Exploring community awareness and understanding of non-communicable chronic diseases

Supervisor/s: Colin Bell, Andrew Sanigorski, Nic Brayshaw

Location: Kardinia Health

Research centre: CPHR

Project description:

Chronic diseases and obesity prevalence rates continue to rise and account for more than three-quarters of all premature death and ill health. Lifestyle and related behaviours are recognised as strong contributors to the development of chronic disease, with obesity a major risk factor identified in most of these conditions.

Health literacy is a significant indicator of health status, and assessment has the potential to enhance patient care. Previous studies have indicated that up to a quarter of Australians may have suboptimal health literacy, with additional evidence suggesting that those with low health literacy have higher health costs, inefficient service use, and lower use of preventative services than people with adequate health literacy.

This project aims to assess health literacy levels between different patient subgroups, awareness of risk factors and sources of health knowledge accessed. Further program will involve, (i) patient understanding and motivations behind healthy/unhealthy lifestyle choices (ii) community attitudes towards primary and secondary prevention and (iii) lifestyle modification and the role of primary healthcare provider involvement required to support patient needs versus regulation and policy.

The candidate will be required:

- To undertake a literature review
- Receive training in questionnaire delivery (verbal & digital)
- Conduct questionnaire interviews
- Collate, extract, transcribe and clean questionnaire data
- Be involved in data interpretation, thematic analysis and manuscript preparation

Contact supervisor:
Prof. Colin Bell (School of Medicine): colin.bell@deakin.edu.au

Suitable for: Honours

Metabolic Disease

Project reference: 1465

Multimodal PET/MR imaging contrast agents for diagnosis and therapy of atherosclerosis

Supervisor/s: Jagat Kanwar, Rajneesh Chaudhary

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

BACKGROUND: Cardiovascular diseases (CVD) are a major global health burden worldwide including Australia. Atherosclerosis is a multifactorial arterial pathology and the major cause of CVD. Despite recent clinical and biomedical advancements in this field of CVD, we still need more innovative non-invasive diagnostic and therapeutic probes. The present proposed study focuses on the development of multimodal zinc ferrite nanoparticles for magnetic resonance imaging (MRI) coupled with radioactive copper, positron emission tomography (PET) to detect unstable atherosclerotic plaque with high precision and sensitivity. These smart nanoparticles will be targeted towards matrix metalloproteinase degraded collagen by a highly specific peptide to enable binding to highly inflamed atherosclerotic plaques. Magnetic nanoparticles subjected to an alternating magnetic field in our novel magnetic particle imager can further lead to hyperthermia based non-invasive dissolution of arterial plaques, developing an innovative therapeutic strategy. In this project we develop 3D blood capillaries with atherosclerosis. Moreover, magnetic hyperthermia could enable therapy, developing a novel dual diagnostic/therapeutic technology for subsequent clinical trials. The technology could provide early pathological information and next stage will be tested in ex vivo or 3D models.

AIMS: 1. Development of MRI/PET nanoparticle-based contrast agents targeting atherosclerosis. 2. Evaluation of the developed imaging probes in an established 3D blood vessels ex vivo and 3D models. 3. To test an innovative hyperthermia therapy for atherosclerosis site.

RESEARCH PLAN: The smart nanoparticle based contrast agents will be developed and injected in 3D developed blood vessel models followed by PET/MRI periodically to evaluate the molecular targeting followed by histological/biodistribution studies.

TECHNIQUES: Preparation of nanoparticles, MRI/PET imaging and development of ex vivo or 3D blood vessel models.

Contact supervisor:
Prof. Jagat Kanwar (School of Medicine): jagat.kanwar@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1438

Hydrogen sulfide signalling in the placenta

Supervisor/s: Bryony McNeill

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

During pregnancy, the placenta plays a critical role in delivering oxygen and nutrients to the developing fetus, and is a key determinant of fetal growth and development. Successful development of the placenta requires the growth of a complex, highly regulated, vascular network to facilitate communication between mother and fetus. Impaired placental vascular signalling has been implicated in many diseases of pregnancy, including pre-eclampsia, fetal growth restriction and gestational diabetes. These conditions are associated with significant risks to both mother and fetus, and have ongoing implications for the health and wellbeing of the infant in later life. The signalling mechanisms in the placenta which are affected in these conditions are still being identified.

One of the key areas of interest in my laboratory is the role of hydrogen sulfide in the placenta. Previously considered a noxious gas, hydrogen sulfide is now known to be an important signalling molecule in the body with altered production of the molecule being linked to many cardiovascular and other conditions. Recently, a reduction in the enzymatic production of hydrogen sulfide was identified in women with preeclampsia. This discovery has spawned significant interest in the potential for hydrogen sulfide therapy in women with the condition. However, the regulation of hydrogen sulfide production and degradation is complex, and involves the interaction between a number of enzymes and other signalling factors, the role of which have not yet been described in the placenta. This gap in our knowledge forms the basis of this project.

The aim of this project is to extensively characterise the hydrogen sulfide signalling pathways in the placenta, and to examine how these pathways are altered in placental pathologies. Techniques used will include histology, immunohistochemistry, and molecular biology.

Contact supervisor:
Dr. Bryony McNeill (School of Medicine): bryony.mcneill@deakin.edu.au

Suitable for: Honours, MPhil

Project reference: 1431

Bisphenol A exposure, obesity and aging

Supervisor/s: Yann Gibert

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Bisphenol A (A) the number one waste product from the plastic industry has recently been linked to obesity by epidemiological studies. Moreover cell based assays have hypothesized that BPA exposure can cause premature aging in humans. To date the proof of BPA action on premature aging in vertebrate organism has yet to be demonstrated and the mechanism of action of BPA in inducing BPA is unknown. While several cellular stress signaling mechanisms underlie the pathogenesis, recent studies implicate a role for endocrine disruptors like BPA to augment and accelerate these processes. As several reports suggest that BPA may have estrogen receptor-independent effects, identifying the specific mechanisms by which BPA could affect a range of cellular pathways is a thrust area of research. Using the zebrafish model that my Lab has established or BPA study, this proposal will answer both question in vivo using molecular biology, genetics, developmental biology, lipid study, physiological studies and toxicology.

Techniques to be used:

- quantitative PCR
- measure of senescence in vivo
- BPA exposure of zebrafish embryos
- Lipid analysis

Contact supervisor:
Dr. Yann Gibert (School of Medicine): y.gibert@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1430

Action of Dopamine and antipsychotics on bone formation

Supervisor/s: Yann Gibert, Lana Williams

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Antipsychotics are amongst the most commonly used medications, and their use for schizophrenia and related conditions tends to commence in early adulthood and be lifelong. Both dopamine (DA) and antipsychotics affect bone metabolism. In one study, DA-transporter (DAT)-deficient mice displayed a low bone mass phenotype. However their role during bone formation is still unknown. This project will investigate the effects of DA and selected antipsychotics on bone development during zebrafish embryogenesis. At the time of bone induction, at 48 hours post fertilization (hpf) zebrafish embryos will be exposed to DA, and selected antipsychotics until fixation at 72, 96 hpf or 5.5 days pf (dpf). Resulting phenotype on bone development will be monitor by Alizarin red staining for mineralised tissue, alkaline phosphatase for osteoblast lineage. All staining will be performed at 5.5 dpf. Expression of several genes markers of bone development will be investigated by whole mount in situ hybridisation (WISH): runx2a and runx2b (for osteoprogenitor cells), osterix and osteocalcin (for differentiating osteoblast), alkaline phosphatase, and colagen10a1 (for mature osteoblast) and matrix metalloproteinase 9 (for osteoclast lineage). WISH will be performed at 72 or 96 hpf depending of the probe used. This project will definitively linked dopamine and antipsychotic and bore formation in vertebrates

Contact supervisor:
Dr. Yann Gibert (School of Medicine): y.gibert@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1420

Reprogramming adipose tissue to increase energy expenditure and combat obesity

Supervisor/s: Sean McGee

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

The prevalence of obesity continues to soar and it is driving an epidemic of chronic diseases that imparts a huge burden on national healthcare systems and economies. Despite intensive social/educational intervention approaches, the incidence of obesity continues to rise. Therefore, identification of molecular targets that can be used to therapeutically combat obesity is required. We have generated evidence that protein kinase D (PKD), a relatively understudied kinase, has important roles in regulating both energy expenditure through its action in adipose tissue.

This project will further examine the role of PKD in the regulation of energy balance by using a novel mouse model in which a genetic loss of PKD function can be induced exclusively in adipose tissue. This mouse model will be used to characterise the role of PKD in the control of energy expenditure and the molecular mechanisms involved as well as determine whether PKD is an effective therapeutic target to combat obesity. Approaches including indirect calorimetry and metabolic responses to nutrients and hormones will be used to understand the phenotype of these mice, while molecular biology approaches including western blotting, real time RT-PCR and biochemical approaches such as metabolite measurements will be used to determine the molecular mechanisms involved.

This project will in increase our understanding of the mechanisms controlling energy balance and could uncover new approaches to combat the obesity epidemic.

Contact supervisor:

Assoc. Prof. Sean McGee (School of Medicine): sean.mcgee@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1395

Adaptation of VEGF binding aptamers to monitor bevacizumab efficacy in the treatment of AMD

Supervisor/s: David Hammond, Sarah Shigdar

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

The most prevalent causes of blindness and vision loss in Australia are age-related degenerative eye diseases such as macular degeneration, glaucoma and cataract. Exudative age-related macular degeneration (wet AMD) affects approximately 10-15% of individuals. In wet-AMD vascular endothelial growth factor (VEGF) is released in the retina promoting the growth of abnormal blood vessels. These new blood vessels bleed and leak fluid, resulting in severe loss of central vision.

The mainstay of therapy is repeated intravitreal injections of an anti-VEGF monoclonal antibody (bevacizumab) which prevents the growth and leakage of new blood vessels. Each single injection of ranibizumab costs $300.75 with the forecast 4-year future cost to the Pharmaceutical Benefits Scheme to be $629.5 million. Over time bevacizumab effectiveness will decrease in the vitreous of the eye and it's VEGF blocking action will be diminished. Currently the intravitreal treatment frequency varies between doctors, ranging from monthly intravitreal injections to injections only being administered when further vessel growth or leakage is noted. The variability in therapeutic protocols is due to there being no effective, non-invasive in vivo method of monitoring the effectiveness of bevacizumab at blocking VEGF. Inclusion of a reporter molecule that signals the presence of VEGF in an intravitreal injection could potentially offer an objective method of determining when further injections are indicated, avoiding over-treatment resulting in significant cost savings to the PBS.

This project will investigate if novel nucleic acid aptamers can be altered with fluorogenic moieties to act as VEGF reporter molecules. As a proof of concept project, you will be designing the anti-VEGF aptamers and testing their effectiveness as a reporter in vitro using cultured mammalian cell lines. This project will use a variety of spectroscopy techniques, tissue culture, protein and molecular biology methods.

Contact supervisor:

Dr. David Hammond (School of Medicine): david.hammond@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1393

Diabetes, pre-diabetes and early mortality

Supervisor/s: Kara Holloway, Julie Pasco, Natalie Hyde, Lana Williams

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

Diabetes mellitus is a complex disease that is also increasing in prevalence and can lead to serious health complications, such as stroke, nephropathy, retinopathy, neuropathy and lower limb amputation. It has also been shown that diabetes leads to premature mortality, but whether impaired fasting glucose (IFG) also increases mortality risk is still controversial. Some studies have demonstrated a relationship between IFG and mortality; but others have reported no associations. The project will investigate this further; the candidate will determine if there is an association between dysglycaemia (IFG or diabetes) and mortality among men recruited for the Geelong Osteoporosis Study. The candidate will also explore the factors affecting this association such as smoking status, medication use and comorbid conditions such as obesity and metabolic syndrome.

The candidate will work closely with the research team at the Epi-Centre for Healthy Ageing, in the Innovations in Mental and Physical Health and Clinical Trials Strategic Research Centre (IMPACT SRC), situated at Barwon Health. The project will foster an appreciation of epidemiological study design, sampling techniques, participant-researcher interaction, database design and management, and statistical analysis. The candidate will be collecting primary data from men at their current follow-up visit for the Geelong Osteoporosis Study, as well as performing data cleaning, analysis and interpretation.

Contact supervisor:
Dr. Kara Holloway (School of Medicine): k.holloway@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1389

A cure for Type 1 Diabetes: improving islet transplantation success

Supervisor/s: Kathryn Aston-Mourney

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Type 1 diabetes is one of the most common chronic diseases in children. It is characterised by autoimmune destruction of the insulin producing cells in the pancreas (β-cells) resulting in the need for insulin injections. New hope for a cure has been given with the development of islet transplantation techniques however currently these require several donors in order to provide enough islets and the long term success rates are poor with only 10% of transplants still functioning after 5 years. This poor success is due in part to the high amount of stress the islets undergo both during the isolation procedure from donors and during and following the transplant. Therefore the development of techniques to protect the islets from these stressors would greatly increase not only transplant success but also long-term outcomes.

The lab is developing novel compounds that can protect islets from diabetic conditions. This project will determine whether this drug can protect form islet isolation stress and/or stress in the post-transplantation period. Ultimately this project could lead to the optimisation of islet isolation procedures and transplant recipient treatment greatly improving the success of this cure.

Summary of techniques to be used:

- Cell culture
- Islet isolation
- Islet transplantation
- Ex vivo culture of pancreatic islets
- Analysis of insulin secretion
- Analysis of cell death
- RNA extraction and purification
- Real-time PCR
- Western blotting
- ELISA
- Immunohistochemistry

Contact supervisor:
Dr. Kathryn Aston-Mourney (School of Medicine): k.astonmourney@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1388

Discovery of new drugs for the treatment of diabetes

Supervisor/s: Kathryn Aston-Mourney, Ken Walder

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Type 2 diabetes is one of the major health burdens facing the world today. Diabetes is characterised by failure of the insulin producing cells in the pancreas (β-cells). β-cell failure is progressive, with patients requiring additional medications over time and eventually insulin injections. Current diabetes treatments cannot stop or slow the progression of β-cell failure; therefore the development of new drugs which can slow this progression is vital. We have developed a novel screening tool for drugs that can protect β-cells. This project will optimise candidates identified from this tool and test their effectiveness in cell and animal models of diabetes.

Summary of techniques to be used:

- Cell culture
- Ex vivo culture of pancreatic islets
- Analysis of insulin secretion
- Analysis of cell death
- RNA extraction and purification
- Real-time PCR
- Protein extraction
- Western blotting

Contact supervisor:
Dr. Kathryn Aston-Mourney (School of Medicine): k.astonmourney@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1387

Discovery of new targets for the treatment of diabetes

Supervisor/s: Kathryn Aston-Mourney

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Type 2 diabetes is one of the major health burdens facing the world today with 422 million people affected. Type 2 Diabetes is characterised by hyperglycaemia due to failure of the insulin producing cells in the pancreas (β-cells). β-cell failure is progressive, with patients requiring additional medications over time and eventually insulin injections in order to control their blood glucose levels. Current diabetes treatments cannot stop or slow the progression of β-cell failure; therefore it is vital that we obtain a better understanding of how β-cell failure occurs and how it could be targeted by new treatments.

This project will investigate possible contributors to β-cell failure and whether they can be targeted pharmacologically to reduce β-cell failure and thereby delay or prevent the development and progression of β-cell failure in Type 2 Diabetes.

Contact supervisor:
Dr. Kathryn Aston-Mourney (School of Medicine): k.astonmourney@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Musculoskeletal Medicine

Project reference: 1473

Effects of selenoprotein S (SEPS1) on skeletal muscle health and performance

Supervisor/s: Nicole Stupka

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Oxidative stress, inflammation and fibrosis (abbarant synthesis and remodelling of connective tissue) are a hallmark of disease, but carefully regulated these process are improtant for adaptation and regeneration. Exercise, for example, also increases oxidative, ER and inflammatory stress. However, the stress of exercise is transient and leads to improved metabolic and contractile function in skeletal muscle. A stress response protein of particular interest to our group is the selenoprotein S (SEPS1), as it has antioxidant, anti-ER stress and anti-inflammatory properties. SEPS1 has been linked to inflammatory diseases in humans and in mice reduced SEPS1 expression compromises muscle performance and exercise capacity. The underlying mechanisms by which SEPS1 affects muscle function are unknown.

Using cell culture and/or transgenic mouse models relevant to insulin resistance and endurance exercise, this Project will examine how SEPS1 regulates cellular stress responses in skeletal muscles to modulate strength and endurance.

Techniques may include: Transgenic mouse models, cell culture, siRNA, real-time PCR, immunoblotting, immunohistochemistry, histology, and contractile function testing.

Contact supervisor:
Dr. Nicole Stupka (School of Medicine): nstupka@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1471

How does the extracellular matrix protein versican modulate muscle health?

Supervisor/s: Nicole Stupka

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

The connective tissue (extracellular matrix; ECM) that surrounds muscle fibres and their progenitor cells is more than a scaffold to provide structural support; it is a dynamic tissue that sends signals to muscle fibres and progenitor cells to regulate inflammation and repair following injury. For optimal skeletal muscle health, connective tissue composition and remodelling of its constituent components need to be carefully regulated. Versican is an important ECM protein implicated in skeletal muscle development (including the proliferation and differentiation of skeletal muscle stem cells), inflammation and fibrosis.

Duchenne muscular dystrophy (DMD) is a fatal X-linked genetic disease caused a mutation in the dystrophin gene, such that the functional protein is not expressed. This renders muscles vulnerable to contraction-induced injury leading to excess inflammation and degeneration, muscle fibre loss due to ineffective repair, expansion of the extracellular matrix and fibrosis. Muscle repair depends on a carefully co-ordinated inflammatory response, as well as muscle stem cell proliferation and differentiation. Versican is highly upregulated in dystrophic muscles and data from our lab has shown a role for versican in muscle repair which has effects on contractile function.

Using cell culture and/or transgenic mouse models relevant to DMD and versican biology, this project will examine how versican regulates inflammation and muscle stem cell proliferation and differentiation, and the downstream consequences on muscle strength and endurance.

Contact supervisor:
Dr. Nicole Stupka (School of Medicine): nstupka@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1453

Health literacy and use of potentially inappropriate medications in older adults

Supervisor/s: Sarah Hosking, Lana Williams, Jenni Ilomaki, Kara Holloway

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

International research demonstrates between 20 - 40% of older adults are prescribed medications that are potentially inappropriate (including medications that do not align with goals of care or cause side effects, such as falls, that outweigh potential benefits). Emerging evidence suggests a social gradient exists in the use of inappropriate medications, with socioeconomically disadvantaged individuals and those with lower education levels more likely to use potentially inappropriate medications. It is likely that health literacy plays a role in the relationship between social disadvantage and use of potentially inappropriate medications, however, there is currently a paucity of data in this area.

This project will utilise data from the population-based Geelong Osteoporosis Study (GOS) cohort and link with pharmaceutical benefits scheme (PBS) data to investigate associations between social disadvantage, health literacy and use of potentially inappropriate medications.

The candidate will work with a multi-disciplinary team of researchers in undertaking this project. The project will provide opportunities for the candidate to develop a greater understanding of the role of health literacy in health-related decision making, assist with data collection as part of the current follow-up of the GOS cohort, undertake data linkage and perform statistical analyses. It is anticipated the candidate will learn and utilise cluster analyses and regression analyses as part of this project.

Contact supervisor:
Dr. Sarah Hosking (School of Medicine): SHOSKI@BarwonHealth.org.au

Suitable for: Honours

Project reference: 1449

Investigating gene expression data to identify peripheral biomarkers in adhesive capsulitis

Supervisor/s: Richard Page, Sean McGee, Stephen Gill

Location: Waurn Ponds Campus

Research centre: CMMR, Other

Project description:

Adhesive capsulitis is a disabling and poorly understood pathological condition of the shoulder. The condition affects between 2-5% of the general population and up to 20% of people with diabetes.

Our team is currently investigating transcriptome-wide alterations in gene expression, clinical biomarkers from serum and urine samples, and clinical outcomes following shoulder surgery for people with adhesive capsulitis.

The aim of this project is to interrogate gene expression data to identify potential serum and urine biomarkers that might assist in the early diagnosis and staging of adhesive capsulitis, cross-referencing for targeted markers in the peripheral samples.

Professor Page, orthopaedic surgeon, has collected tissues samples from patients undergoing shoulder surgery for adhesive capsulitis, and for comparison, from people undergoing surgery for shoulder instability. We have commenced analysing samples for gene expression using NexGen sequencing techniques in collaboration with Assoc. Prof Sean McGee. Using bioinformatics approaches, the student will assist in identifying candidate biomarkers of adhesive capsulitis, which will be examined in patient plasma using ELISA and multiplex immunoassay approaches.

Contact supervisor:

Prof. Richard Page (School of Medicine): richard.page@deakin.edu.au

Suitable for: Honours, MPhil

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

Project reference: 1437

Outcomes following surgical repair or replacement of arthritic v non-arthritic shoulder pathologies

Supervisor/s: Richard Page, Stephen Gill, Graeme Brown, Kevin Eng

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Shoulder pain affects up to 25% of the general population at any time. Pain can be related to soft tissue pathologies such as rotator cuff disease and/or joint pathology such as arthritis. Surgical interventions for shoulder pain and dysfunction are increasingly common, but outcomes following surgery require further investigation.

The aim of the current study is to evaluate patient functional outcomes following surgical repair of soft tissue shoulder pathology or replacement for shoulder arthritis. Outcomes will include pain, function and quality of life.

The project will be completed in conjunction with Geelong Orthopaedics, Barwon Health and St John of God Hospital Geelong. Pre-operative and post-operative outcomes are routinely collected from patients undergoing shoulder replacement as well as shoulder instability and rotator cuff surgery.

The student will extract data from current Barwon Centre for Orthopaedic Research and Education (B-CORE) and Geelong Orthopaedics databases, including contacting patients for missing data. The primary analysis will involve comparing patient reported outcomes (pain, function and quality of life) for patients undergoing surgical repair of soft tissue shoulder pathology versus replacement for shoulder arthritis. Analysis will involve regression techniques such as mixed linear models.

The results of the study will provide initial evidence that compares post-surgical outcomes for soft tissue repair and replacement.

Contact supervisor:

Prof. Richard Page (School of Medicine): richard.page@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1435

Evaluating patient outcomes following reverse versus anatomical shoulder replacement

Supervisor/s: Richard Page, Stephen Gill

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Shoulder replacement is the fastest growing type of joint replacement worldwide, being used to treat an expanding variety of traumatic and degenerative shoulders disorders. The use of reverse total shoulder replacement (RTSR) is increasing rapidly, however, there is limited evidence describing functional outcomes following RTSR compared to the traditional conventional shoulder replacement (TSR) for similar conditions.

The aim of the current study is to evaluate patient outcomes following RTSR compared to TSR. Outcomes will include pain, function, quality of life and complications.

The project will be completed in conjunction with Geelong Orthopaedics, Barwon Health and St John of God Hospital Geelong. Pre-operative and post-operative outcomes are routinely collected from patients undergoing shoulder arthroplasty at these centres.

The student will extract data from current Barwon Centre for Orthopaedic Research and Education (B-CORE) and Geelong Orthopaedics databases, including contact patients for missing data. The primary analysis will involve comparing patient reported outcomes (pain, function and quality of life) for patients undergoing RTSR versus TSR. Analysis will involve regression techniques such as mixed linear models.

The results of the study will provide evidence of the comparative risks and benefits of RSR and TSR, and will inform surgeon decision making.

Contact supervisor:
Prof. Richard Page (School of Medicine): richard.page@deakin.edu.au

Suitable for: Honours, MPhil

Other considerations:

This project is subject to final approvals.

Project reference: 1434

Evaluating a remote model post-arthroplasty review model of care

Supervisor/s: Stephen Gill, Richard Page

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Over 115,000 hip, knee and shoulder replacements occurred in Australia in 2017, and this number is expected to double over the next 10-20 years. In public hospitals, regular post-arthroplasty orthopaedic review has commonly occurred for the duration of a patient's life, which requires substantial time and cost for outpatient services, and for patients and families.

In 2016, Barwon Health evaluated existing follow-up procedures of patients following joint replacement and discovered that few complications were identified in routine outpatient appointments. Subsequently, the service was redesigned to a remote model of care. The new model involves patients completing questionnaires in their home and returning them via post. Only patients with suspected complications are assessed in-person.

The aim of the study is to evaluate the effectiveness and safety of the new remote model of care. Specifically, the study will evaluate whether the model identified complications, whether the model meets the needs and preferences of patients and health care providers, and whether patient reported outcomes are at least equivalent to the pre-existing model.

The student will extract data from current Barwon Health and Barwon Centre for Orthopaedic Research and Education (B-CORE) databases regarding post-operative complications and patient reported outcomes (questionnaire data). Patients and staff will be surveyed regarding their experiences and satisfaction with the new model of care. Data will be presented with descriptive statistics. Patient reported outcomes from before and after the introduction of the new model will be analysed with regression techniques such as mixed linear models.

The results of the study are of interest to public orthopaedic services throughout Australia and worldwide, who are seeking safe, effective and cost-efficient methods to care for increasingly large numbers of people following joint replacement.

Contact supervisor:
Dr. Stephen Gill (School of Medicine): stephen.gill2@deakin.edu.au

Suitable for: Honours, MPhil

Project reference: 1400

Assessing the role of the HDACi, Panobinostat in, bone morphogenesis

Supervisor/s: Rasika Samarasinghe, Jason Hodge, Sean McGee

Location: Waurn Ponds Campus

Research centre: CMMR, GCEID

Project description:

Therapies that regulate epigenetic mechanisms is emerging as promising treatments for a wide range of diseases including cancer, neurodegenerative and infectious disorders. Histone deacetylases (HDAC) are one such class of modulators that are known to play an important role in regulating these epigenetic pathways and inhibitors (HDACi) that act on these modulators have been used clinically to treat a number of solid and haematological malignancies. Recently, studies have shown the influence of HDACis on bone metabolism and their ability to inhibit bone loss.

Pathological bone loss is associated with many common diseases including osteoporosis, metastatic diseases of bone and rheumatoid arthritis. Bone homeostasis is maintained by a process called remodelling, which involves the tight coupling of bone resorption, performed by osteoclasts (OC), with subsequent bone formation performed by osteoblasts (OB). This coupling is essential for the correct function and maintenance of the skeletal system, repairing microscopic skeletal damage and replacing aged bone. A disruption of normal bone remodelling, with enhanced bone resorption by OC is a characteristic feature of the above diseases and hence factors that reduce OC resorption have become important targets for therapeutic intervention. Recently, we have found that the HDACi, Panobinostat, when given in low doses induced osteoblast differentiation in human osteosarcoma and rhabdoid tumours. The aim of this study is to elucidate the mechanisms by which Panobinostat regulates osteogenesis using human in vitro models. This project will utilize cell culture techniques, molecular techniques such as polymerase chain reaction, Western blot analysis and immunohistochemistry.

Contact supervisor:

Dr. Rasika Samarasinghe (School of Medicine): rasikas@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1394

Early life exposures and fracture risk

Supervisor/s: Natalie Hyde, Kara Holloway, Julie Pasco, Lana Williams

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

The developmental origins of health and disease theory postulates that early life exposures contribute to a substantial proportion of chronic disease risk and health outcomes. Thus, there is potential scope to identify modifiable risk factors in early life to reduce the risk of adverse health outcomes, such as fracture, in later life. This project will examine associations with early-life exposure (including maternal vitamin D and season of birth) and fracture risk sampling data primarily from the Vitamin D in Pregnancy Study and the Geelong Osteoporosis Study. Data will be linked to the comprehensive Geelong Osteoporosis Fracture Grid to record incident fractures and students will identify prospective fractures from radiological reports. Multivariate statistical techniques, such as regression modelling, will be used to identify predictors of fracture. The candidate will assist with collecting equivalent data in the current follow-up of for the Geelong Osteoporosis Study. Tasks will include administering participant questionnaires and performing clinical measures such as height, weight, circumferences and muscle strength.

The project will be situated at Barwon Health with the Epi-Centre for Health Ageing team within the IMPACT SRC. The candidate will be presented with the opportunity to develop their research skill-set, specifically in the areas of epidemiological study design and data analysis, database management and participant-researcher interaction.

Contact supervisor:
Dr. Natalie Hyde (School of Medicine): natalie.hyde@deakin.edu.au

Suitable for: Honours

Project reference: 1492

Identifying potential blood biomarkers of cognitive decline: Investigation on the biochemical basis

Supervisor/s: Veer Gupta

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

At present, around 50 million people worldwide suffer from Dementia. The World Alzheimer Report 2016 states that most people with dementia do not have access to appropriate healthcare facilities. Thus, the need of the hour lies in developing a rapid, discriminatory screening tool that is more accessible to general population and supports early detection of cognitive decline.

Proteomics studies are extremely important in understanding the altered metabolic pathways and intracellular modulations. In addition, proteomics studies are often complemented with metabolomics analysis and thus can directly correlate to the phenotype of an individual. Since earlier reports have shown cholesterol levels to modulate the amyloid aggregation in Alzheimer's disease and thus lipidomics studies also become quite pertinent in such case. In this era of personalized medicine, these multi-omics approaches play a key role in studying disease diagnosis and prognosis, and can be extensively employed in early disease detection to identify the appropriate biomarkers and perturbed metabolic pathways.

Thus, this study aims to define a panel of biomarkers in blood that can distinguish individuals with cognitive decline from normal individuals. This project proposes to contribute towards the identification of key regulatory biomolecules that can translate into a potent blood-based biomarker panel for an early detection of cognitive decline. Several high-throughput mass spectrometry approaches like proteomics, metabolomics, lipidomics etc. will be employed in this study to unravel the key biomolecules whose expression patterns change during the aging process ensuring high levels of sensitivity and specificity. The detection of a panel of biomarkers in blood has immense medical implications and can be further extrapolated to clinical settings.

Techniques involved: Aliquoting blood samples, processing blood samples, pre-preparation for analysis, mass-spectrometry analysis, statistical analysis.

Contact supervisor:
Assoc. Prof. Veer Gupta (School of Medicine): veer.gupta@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:
This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

This project is subject to final approvals.

Neuroscience

Project reference: 1470

Glycosaminoglycan metabolism as a mechanism of action of drugs used to treat schizophrenia

Supervisor/s: Chiara Bortolasci, Ken Walder, Laura Gray

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Schizophrenia ranks in the top 10 medical disorders in terms of global burden of disease and disability. The cellular and molecular basis for altered brain function in patients with schizophrenia remains poorly understood. Accordingly, mechanisms underlying the molecular effects of drugs used to treat SCZ are largely unknown. We treated human neuronal cells with clozapine, risperidone, amisulpride and aripiprazole and used next generation sequencing to identify glycosaminoglycan metabolism (which plays a key role in modulating the extracellular matrix) as a novel pathway regulated by each of the four drugs, making this pathway a new target for the treatment of schizophrenia.

In this project, the student will validate these findings by measuring the expression of genes involved in glycosaminoglycan metabolism, and use bioassays to directly measure the effects of the drugs on this pathway.

The techniques involved in this project include cell culture, cell-based laboratory experiments, microscopy, RNA extraction and real-time PCR.

Contact supervisor:
Dr. Chiara Bortolasci (School of Medicine): bchiara@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1469

Effects of trimetazadine in neuronal stem cells

Supervisor/s: Ken Walder, Chiara Bortolasci

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Mental illness accounts for 27% of all disability in Australia, with one in five people experiencing mental illness every year. Current treatments for mental illness have limited efficacy, and often side effects that become intolerable, and new treatments are urgently needed. We used global gene expression profiling to discover new drugs that could potentially be repurposed for bipolar disorder. Our screen identified trimetazadine, an anti-ischaemic agent previously used as an adjunctive agent to treat stable angina pectoris, as an agent with potential to treat bipolar disorder. Trimetazadine affected global gene expression in cultured neuronal cells in a manner similar to currently marketed drugs for bipolar disorder. Interestingly, trimetazadine is known to affect several pathways that have recently been implicated in the pathophysiology of bipolar disorder, namely mitochondrial function, oxidative stress and inflammation. In clinical trials, trimetazadine has shown beneficial effects on cardiac function, and also a decrease in all-cause mortality, making it a very safe drug. Most previous studies have focussed on the effects of trimetazadine in cardiac muscle models, and have shown beneficial effects on mitochondrial function, as well as evidence of anti-inflammatory and anti-oxidant effects. While several studies have shown potential neuroprotective effects of trimetazadine in rodent models, the actions of trimetazadine on neuronal cells is unknown. In this project we will determine the effects of trimetazadine on mitochondrial function, oxidative stress and inflammation in cultured human neuronal stem cells. The project will include a range of techniques including cell culture, mitochondrial flux bioanalysis, real-time PCR, a range of bioassays, histology and flow cytometry. The results of this project will inform the further development of trimetazadine as a potential new treatment for bipolar disorder.

Contact supervisor:
Prof. Ken Walder (School of Medicine): walder@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1468

Bipolar disorder brain in a dish: Using stem cells to understand lithium response

Supervisor/s: Chiara Bortolasci, Ken Walder, Laura Gray

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Bipolar disorder (BD) is a neuroprogressive, chronic mental health condition with progressive social and cognitive function disturbances. Lithium is one of the oldest psychiatric drugs and remains the first-line treatment in the management of BD. However, clinical response to lithium is diverse, with some patients responding effectively after a few doses and others not stabilizing even after months of treatment. Many findings of lithium effects are derived from laboratory animals or from studies in healthy volunteers obscuring possible differences in effects in responders, non-responders and healthy people. In addition, many studies exploring the pharmacological effects of lithium do not incorporate lithium response or studies were conducted while the individuals were simultaneously on a number of medications. Therefore, the results are difficult to interpret as solely due to lithium effects.

In recent years, it has become clear that one of the best model systems to use for neuroscience research is human induced stem cells that can be differentiated into various brain cells. Using this novel technique, we have been generating human induced stem cells from BD patients and healthy controls. These cells are then differentiated into neurons and astrocytes and are the model systems used in our in vitro studies. In this project, the student will evaluate aspects of neuronal plasticity and mitochondrial function in cells from patients that respond to lithium compared with cells from non-responders.

The techniques involved in this project include cell culture, cell-based laboratory experiments, microscopy, immunocytochemistry, mitochondrial flux analysis, RNA extraction and real-time PCR.

Contact supervisor:
Dr. Chiara Bortolasci (School of Medicine): bchiara@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1464

Mixed methods analysis of the effects of treatment with mitochondrial agents in bipolar depression

Supervisor/s: Alyna Turner, Olivia Dean

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

Very few clinical trials incorporate a qualitative component into their design. This novel project will involve the analysis of qualitative data collected as part of a study investigating the effects of N-acetyl cysteine and mitochondrial agents (specifically selected vitamin and mineral supplements), added on to participant's usual treatment for bipolar depression. As part of this study, case notes have been recorded detailing participant's subjective feelings of changes in their symptoms while on the trial. Similarly, notes have also been collected on subjective clinician opinions on how the participant's symptoms have changed over the course of the trial. The student will be responsible for extracting, collating and analysing the case notes of the 181 available participant files that have been entered into the database. Using themes analysis, the student will extract themes surrounding change in symptoms and presentation to determine whether qualitative, self-reported benefits (or deterioration) emerge that are related to treatment group membership. This project would involve the collation and analysis of these qualitative notes to determine themes surrounding the potential benefit of the treatment.

Contact supervisor:

Dr. Alyna Turner (School of Medicine): a.turner@deakin.edu.au

Suitable for: Honours

Project reference: 1462

Return to work following stroke: perspectives and experiences of caregivers

Supervisor/s: Alyna Turner, Lesley Berk

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

Stroke is becoming more common in people of working age, and return to work (RTW) after stroke is an important rehabilitation outcome post stroke. Studies have investigated factors that are predictive of RTW and interventions that may assist stroke survivors to RTW, but less is known about the experiences and perspectives of caregivers or support persons during the RTW process. Stroke is known to precipitate role changes, increased financial stressors, and relationship stressors. Many of these issues may be exacerbated when the stroke survivors future employment potential is challenged. We are currently running a pilot program designed to assist stroke survivors stay in work following their stroke. The student will utilize a mixed model approach to understand the experiences of the informal caregivers or support persons of program participants, identify their perceptions of facilitators and barriers to the return to work process, and identification of strategies that provide assistance to the caregiver/ support person during this process. Information will be utilized to develop and refine interventions targeting the needs of caregiver/support persons of stroke survivors who were working prior their stroke.

Contact supervisor:
Dr. Alyna Turner (School of Medicine): a.turner@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Project reference: 1452

Reducing the risk of mood disorders: An investigation of non-psychiatric drugs

Supervisor/s: Lana Williams, Ken Walder

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

Mental health disorders are one of the major medical problems facing Australia today, accounting for more than a quarter of total disability. Current treatments are proving to be inadequate to combat these disorders, and the impact on the health system, society and the economy is substantial given that these disorders commonly occur in adolescents and young adults, when sufferers should be in their prime. We used a reverse engineering approach to identify drugs that can be repurposed to treat bipolar disorder. Using molecular biology and bioinformatics techniques, we have identified a set of drugs previously used to treat other diseases, and with known clinical safety profiles, that act on a global transcription in a manner similar to a cocktail of currently marketed bipolar disorder drugs. Guided by these previous findings, data from the populat ion-based, Geelong Osteoporosis Study will be utilised to determine whether these specific agents indeed are associated with a reduced risk of mood disorders.

This project will provide the student with an opportunity to become involved in a large and ongoing epidemiological study. The student will be involved in all aspects of the research process from collecting health data from research participants to entering the information into large databases and completing statistical analyses utilising regression techniques.

Contact supervisor:
Assoc. Prof. Lana Williams (School of Medicine): l.williams@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1451

Psychiatric disorders, treatment and medical comorbidities

Supervisor/s: Lana Williams, Kara Holloway, Natalie Hyde, Julie Pasco

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

Mood, anxiety and personality disorders impose huge costs, both on the individual and the community, yet we have an incomplete understanding of their impact on lifestyle, social and in particular medical factors. The aim of this project is to investigate psychiatric disorders, their treatment and medical co-morbidities in men and women participating in the Geelong Osteoporosis Study. Mood, anxiety and personality disorders will be assessed utilising the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Non-patient edition (SCID I & II/NP) and psychological symptomatology using the Hospital Anxiety and Depression Scale (HADS). Information on demographic, lifestyle, medication use and somatic illness is obtained via questionnaire.

This project will provide the student with an opportunity to become involved in a large and ongoing epidemiological study. The student will be involved in all aspects of the research process from collecting health data from research participants to entering the information into large databases and completing statistical analyses. Multiple regression techniques will be used to determine associations between psychological disorders and symptoms and various health outcomes of interest.

Contact supervisor:
Assoc. Prof. Lana Williams (Barwon Health): l.williams@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1444

Investigating the effect of N-Acetyl cysteine on smoking cessation

Supervisor/s: Wolfgang Marx, Olivia Dean, Alyna Turner

Location: Health and Education Research Building, Geelong

Research centre: IMPACT

Project description:

N-Acetyl-Cysteine is an amino acid that has been previously trailed as an adjunctive therapy for a range of mood and mental health outcomes including bipolar disorder and depression. Recent evidence suggests that it may also be efficacious for smoking and substance use cessation; however, further research is needed. This project will involve the analysis of relevant data collected from three previously completed randomized controlled trials. The student will be supported to conduct a preliminary literature review, develop a research question, duties relevant to data analysis include the cleaning and merging of datasets, and using statistical techniques such as chi-square, t-tests and multivariate regression to explore the research question. The student will also have opportunities to participate in research translation activities conducted at the IMPACT Trials Centre and the Food & Mood Centre (for example, produce and present educational material) and participate in regular research meetings.

Contact supervisor:

Dr. Wolfgang Marx (School of Medicine): wolf.marx@deakin.edu.au

Suitable for: Honours

Project reference: 1415

Healing the body, not harming the brain: preventing cognitive impairment after surgery

Supervisor/s: Laura Gray, Andrew Marriott, Olivia Dean, Michael Berk

Location: Barwon Health, Geelong

Research centre: CMMR

Project description:

Thousands of surgeries are performed each year in the Barwon region alone, and surgical intervention and associated anaesthesia is an essential component of modern medicine. However, a proportion of patients who undergo surgery, particularly elderly patients, report a period of confusion and cognitive impairment after the procedure. This suggests that surgery and anaesthesia, although medically necessary, may have adverse effects on neurological function with important consequences for patients. Critically, those who suffer a period of cognitive dysfunction after surgery may also be at risk of later developing dementia. Our developing understanding of the processes involved in cognitive dysfunction, as well as the effects of anaesthesia on the brain, has highlighted a potential therapeutic agent. The anti-inflammatory and anti-oxidant drug N-acetylcysteine is a safe and well-tolerated medication which has shown great promise in studies of cognition and in the prevention of surgery-associated inflammation. We are currently conducting a large cohort-based study documenting the efficacy of N-acetylcysteine in the prevention of post-operative cognitive decline. The student involved in this project would be working alongside clinicians and researchers, and would be involved in cognitive testing, measurement of biomarkers and statistical analysis of data. This project represents an opportunity to be involved in a novel and innovative study with strong prospects for high-impact publication and direct benefits for patient health.

Contact supervisor:
Dr. Laura Gray (School of Medicine): l.gray@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

Project reference: 1407

Neuronal circuitry that drives salt consumption

Supervisor/s: Craig Smith, Laura Gray, Leni Rivera

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Sodium plays many essential biological roles within the body, and is mostly obtained as dietary 'salt' (i.e. NaCl). Consequently, we have evolved a 'salt appetite', whereby dietary salt is 'craved' and highly sought after, and tastes hedonically palatable and rewarding when consumed. Our instinctual love of salt is controlled by neuronal circuitry within the brain. However, in modern society this neuronal circuitry is often maladaptive and drives the overconsumption of salt, as Western and other diets contain excessive amounts of this once rare commodity. Australians consume twice the recommended levels of dietary salt, which contributes to hypertension that accounts for ~50% of all deaths due to stroke and heart disease. Additionally, the high salt content of 'junk-food' contributes to its' high palatability and promotes its' overconsumption, which can cause obesity, diabetes and other metabolic disorders.

This project will help characterise a recently identified pathway in the brain that drives salt appetite. It involves a small cluster of brainstem neurons which are able to detect salt depletion (called 'HSD2 neurons'). These neurons send long projecting axons to several other brain regions that control emotion, motivation and reward, and influence them to drive salt seeking behaviour and consumption. This project will use brains from transgenic mice in which HSD2 neurons and their axonal projections are labelled with the TdTomato fluorophore, allowing them to be histologically visualised. Simultaneous immunohistochemical labelling of other candidate proteins will then allow the neurochemical composition of HSD2 neurons, and their downstream targets, to be determined. This project will further our understanding of the neuronal circuitry that drives salt and junk-food consumption, with direct relevance to health.

Contact supervisor:
Dr. Craig Smith (School of Medicine): craig.smith@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1406

Brain-gut axis expression of the relaxin-3 receptor

Supervisor/s: Craig Smith, Laura Gray, Leni Rivera

Location: Waurn Ponds Campus

Research centre: CMMR

Project description:

Relaxin-3 is a recently discovered neurotransmitter with fascinating biological and functional properties. Pre-clinical studies have revealed that relaxin-3 influences several important processes within the brain related to feeding and the response to stress. The receptor for relaxin-3, RXFP3 (relaxin family peptide 3 receptor), is also highly expressed within the gut, and is likely to play interesting roles which complement its known functions in the brain. The ability of the gut to influence brain processes and the overlap in neuronal function of these two areas is an exciting and growing field, with implications for mental health and diseases such as obesity. Remarkably however, the anatomical distribution and functional role of RXFP3 receptors in the gut is yet to be investigated. This is partly due to technical difficulties in visualising RXFP3-positive cells, using t raditional histochemical approaches. To overcome this problem, our laboratory has obtained tissue from a transgenic strain of mouse in which RXFP3-positive cells express the TdTomato fluorophore.

This project will use immunohistochemistry and microscopy techniques to characterise the location and chemical identity of RXFP3/TdTomato cells in the gut, which preliminary evidence suggests includes enteric neurons. Furthermore, this project will histologically determine the anatomical source of relaxin-3 input to these cells, which may originate locally within the gut, or externally from the spinal cord or circulation. This information will complement our existing knowledge of relaxin-3/RXFP3 function in the brain, and will provide holistic insights into the feeding and other roles played by this system within the brain-gut axis. In doing so, this project will add to our growing understanding of how bidirectional communication between the central and enteric nervous systems may influence obesity and other diseases.

Contact supervisor:
Dr. Craig Smith (School of Medicine): craig.smith@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Project reference: 1405

Exploring the placebo effect in a clinical trial setting

Supervisor/s: Olivia Dean, Linda Byrne

Location: Barwon Health, Geelong

Research centre: IMPACT

Project description:

The placebo response is the improvement (or worsening) of symptoms following treatment with an inert substance (a placebo). Current affective disorders research, especially Major Depressive Disorder, is confounded by very high placebo response rates. This makes finding efficacy signals with novel therapies difficult. There are several approaches to deal with the placebo response in affective disorders trials. For instance, large sample sizes are included to find smaller effect sizes. However, this approach is resource intensive and stifles investigator-initiated trials. Thus, we have taken a different approach by attempting to empower participants, educate them about their placebo response and then evaluate if there are reductions in placebo responses. The project is set within the context of a clinical trial and will involve individual and focus-group interviews and a placebo treatment. Statistical analyses included mixed-models, repeated-measures analysis of variance will be employed. This will explore the impact of the intervention on the placebo response in this group. The outcomes will explore the benefits of the proposed intervention as well as provide significant leads for how future affective disorders clinical trials are designed. Thus, the project has the ability to be high impact.

Contact supervisor:
Dr. Olivia Dean (School of Medicine): o.dean@deakin.edu.au

Suitable for: PhD

Project reference: 1403

Novel blood collection processing compared to previous techniques

Supervisor/s: Olivia Dean, Chiara Bortolasci

Location: Waurn Ponds Campus

Research centre: IMPACT

Project description:

Blood samples collected from human clinical trial participants are extremely valuable and irreplaceable. As such, there is a need to maximise each sample by ensuring the highest number of analyses can be completed. IMPACT TRIALS is dedicated to exploring novel adjunctive therapies for affective disorders. As part of our clinical trials, we collect blood samples at baseline and the end of the trial period. We have found that in our psychiatric samples, the detection of peripheral cytokines is low. We have access to new processing methods that may increase the yield of cytokines and other relevant proteins. The project will include human blood sample processing and determination of cytokines and other proteins, relevant to the pathophysiology of affective disorders. The student will be required to work in the laboratory and complete blood processing and ELISA or bioplex assays. The current project will explore the new methods and determine if our collection and processing procedures should be updated accordingly.

Contact supervisor:
Dr. Olivia Dean (School of Medicine): o.dean@deakin.edu.au

Suitable for: Honours

Other considerations:

This project involves the handling of human blood and bodily substances, any student undertaking this project will be advised by the Principal Investigator to review your vaccination history and immune status.

Project reference: 1392

Examining gaze in behavioural variant frontotemporal dementia and driving, where do patients look?

Supervisor/s: Amanda Douglass, Craig Woods

Location: Waurn Ponds Campus

Research centre: Other

Project description:

Behavioural variant frontotemporal dementia (bvFTD) is the second most common young onset dementia. The average age of onset is 59 years of age, although cases have been reported as young as 21 years. BvFTD results in atrophy of the frontal and temporal lobes producing significant changes to behaviour and personality before progressing to frank dementia. Patients' can display significant disinhibition and/or apathy, and as a consequence these patients have been reported to display altered driving behaviour. Driving is a task many patients persist with as long as possible, as it is strongly linked with independence and social interaction. Impaired driving however, can pose a significant risk to the general public and patients often lack insight into their impairment. Eye movement pathways are well documented, and eye movements are a tool to gain insight into where information is being acquired.

The aim of this project is to examine eye movements and behaviour of bvFTD patients during a driving task in a simulator. The study will use previously recorded eye movement videos of both bvFTD and control participants driving with the primary aim of the study being to determine if eye movements are different between bvFTD and controls, and if eye movement changes are linked with driving performance.

Students will be analysing the eye movements during an already recorded driving simulation in both bvFTD and control participants. This will require identifying areas of interest throughout the videos followed by statistical analysis to compare bvFTD participants to controls. The student's analysis of the videos will be compared to another rater and inter-rater variability considered.

Contact supervisor:

Dr. Amanda Douglass (School of Medicine): amanda.douglass@deakin.edu.au

Suitable for: Honours

Other considerations:

This project is subject to final approvals.

Rural and Regional Health

Project reference: 1489

Evaluating outcomes of a large regional health service's mandatory leadership training program

Supervisor/s: Anna Wong Shee

Location: Ballarat Health Services

Research centre: DRH

Project description:

Effective leadership in healthcare settings is important for the delivery of safe, high quality healthcare. Leaders in healthcare are operating in complex environments and are managing multiple stakeholders, multidisciplinary teams, budgetary constraints, and increasing demands for care quality and safety. Peer review and grey literature on leadership in healthcare suggests there is a leadership capability gap and that many healthcare leaders are unprepared for the demands of their roles. Implementing successful leadership development programs has therefore become necessary to meet important healthcare goals. Ballarat Health Services (BHS) is initiating a large-scale leadership development program to strengthen the capacity of all senior leaders within the organisation to better facilitate the delivery of these critical goals.

The broad aim of this research is to examine the effectiveness of the BHS leadership development program in improving job performance, leadership behaviours, and important healthcare service outcomes by using a structured best practice evaluation model and process. The study has a quantitative cross-sectional design, aligned to Kirkpatrick's model, that will be used to identify outcomes at all four levels (e.g., reaction, learning, transfer and results).

This project will provide students with an opportunity to develop a range of research skills including the conduct of interviews and focus groups, survey design, qualitative and quantitative data analysis.

Contact supervisor:
Assoc. Prof. Anna Wong Shee (School of Medicine): anna.wongshee@bhs.org.au

Suitable for: Honours, MPhil

Other considerations:

This project is subject to final approvals.

Project reference: 1486

Using teach-back to improve health communication in a large regional health service

Supervisor/s: Anna Wong Shee

Location: Ballarat Health Services

Research centre: Other

Project description:

Health literacy is identified as a key priority area in the Victorian Government's Victorian Health Priorities Framework 2012-2022. Health literacy is more than just the ability to read, it includes the ability to understand and interpret health-related information and apply it to a particular situation. Fifty-nine per cent of Australians adults have been identified insufficient health literacy to meet the demands of everyday life. Lower health literacy levels contribute to the poorer health status and health outcomes experienced by rural and regional Victorians. There is a need to support conversations between health providers and patients living in rural and regional areas, to ensure patients feel understood and supported and are able to actively engage with their health care.

Teach-back is a proven communication tool that can be tailored to individual patients' health literacy and used routinely in practice. Simply put, teach-back involves asking patients to explain in their own words what a healthcare provider has just told them. While teach-back is a recommended and evidence-based approach it has not been systematically applied in Australia.

This project will develop, implement and evaluate a local model of teach-back using a co-design approach to ensure relevance in a regional health service. The project will be undertaken in four allied health program areas within Ballarat Health Services. Codesign strategies will be used to integrate teach-back into routine care. Evaluation will use a mixed methods approach involving focus groups and surveys.

This project will provide students with an opportunity to develop a range of research skills including the codesign strategies, conduct of interviews and focus groups, survey design, qualitative and quantitative data analysis. This project will have a strong focus on translation of evidence into practice.

Contact supervisor:
Assoc. Prof. Anna Wong Shee (School of Medicine): anna.wongshee@bhs.org.au

Suitable for: Honours, MPhil

Other considerations:

This project is subject to final approvals.

Project reference: 1485

Night time nudges - impact of a nudge intervention on the dietary choices of night shift nurses

Supervisor/s: Anna Wong Shee

Location: Ballarat Health Services

Research centre: Other

Project description:

Compared to day workers, shift workers are at a higher risk of many diet-related chronic conditions, including obesity, cardiovascular disease, and type 2 diabetes. Health services, as public facilities with a high profile in the community, play an essential leadership role in helping the health workforce make healthier dietary choices. Evidence on effective workplace dietary interventions is limited, particularly in rural and regional areas.

Our project will be conducted in a large regional health service in two phases: Phase 1 will (1) explore, in nursing shift workers, factors influencing dietary intake on day shift and on night shift and (2) assess the types of foods and drinks consumed and the timing of each eating occasion; Phase 2 will use a co-design approach, involving catering and workplace stakeholders, to develop, implement and evaluate a 'nudge' intervention to promote healthy food and drink choices. Like a GPS device, behavioural intervention nudges are designed to guide individuals in certain directions without limiting their freedom of choice. This project will provide important evidence on the dietary choices and the effectiveness of a dietary intervention for shift workers in a regional area.

This project will provide students with an opportunity to develop a range of research skills including the codesign strategies, conduct of interviews and focus groups, survey design, qualitative and quantitative data analysis. This project will have a strong focus on translation of evidence into practice. Partner organisations include local industry, Alfred Health, and the Healthy Eating Advisory Service.

Contact supervisor:
Assoc. Prof. Anna Wong Shee (School of Medicine): anna.wongshee@bhs.org.au

Suitable for: Honours, MPhil

Other considerations:

This project is subject to final approvals.

Project reference: 1482

Optimising the use of embedded researchers for more effective health service-academic collaborations

Supervisor/s: Kevin Mc Namara, Anna Wong Shee

Location: Waurn Ponds Campus

Research centre: DRH

Project description:

There is a growing emphasis on developing genuine partnerships between researchers and health services to promote meaningful research that will be used in practice. The premise for this conviction is that such partnerships will enable better insights into challenges faced by health services, an understanding of how healthcare is delivered on the ground, and an appreciation of what research is most relevant to health services. The use of 'embedded researchers' (ERs) represents a key strategy being used to support these partnerships. Simply put, ERs are clinician researchers who work within a health service while maintaining an affiliation with a research organisation.

Across Victoria, Deakin Rural Health and other research groups have established partnerships with health services and have engaged ERs to facilitate a strong working relationships. These ERs work in different settings, and have varying backgrounds, positions and role definitions (e.g. some undertake clinical work, some managerial, some are research-only). Very little is understood about the support that these ERs need to be effective, the expectations of different stakeholders who support ERs in their work (e.g. hospitals, practices, universities, clinicians), the barriers and enablers to achieving these outcomes, and the impact of these ERs, particularly in rural and regional areas. This project will undertake research to establish a framework for supporting rural and regional ERs and for guiding best practice within these roles. The student will actively engage ERs and other stakeholders to determine their experiences, the nature of current activities, and their attitudes and preferences regarding the role. Data collection will primarily involve interviews, focus groups and surveys in its early stages, and the use of both qualitative and quantitative analysis methods.

Contact supervisor:

Dr. Kevin Mc Namara (School of Medicine): kevin.mcnamara@deakin.edu.au

Suitable for: Honours, MPhil, PhD

Other considerations:

This project is subject to final approvals.

Project reference: 1442

Diabetes and lifestyle risk factors among Victorian farm communities

Supervisor/s: Susan Brumby, Tracey Hatherell

Location: Western District Health Service, Hamilton

Research centre: NCFH

Project description:

Evidence suggests that farmers, being rural Australians, experience higher rates of lifestyle disease compared to people living in metropolitan regions. The prevalence of cardiovascular risk factors and psychological distress among farming populations are higher compared to the national data. Besides social isolation and socio-economic constraints, many lifestyle factors contribute to this increased prevalence. Research suggests that gender is elemental in constructing exposures in and outside the workplace that determine health.

This study will assess lifestyle risk factors among farm communities in Victoria. The factors which will be examined include smoking, alcohol use, sun exposure, waist measurement, blood pressure, blood glucose, blood lipid profile, bowel cancer risk, general health and mental wellbeing. The participants will be >18years of age, speak English and currently farming in Victoria. The study will include analyses of secondary data (which have already been collected) of 2010-17 from the completed projects of National Centre for Farmer Health (NCFH).

The student will be required to undertake a literature review, analyze and interpret data, publish and present in forums.

Contact supervisor:
Prof. Susan Brumby (School of Medicine): susan.brumby@wdhs.net

Suitable for: Honours

Project reference: 1441

An investigation of behavioural indicators of suicide stigma reduction

Supervisor/s: Alison Kennedy, Susan Brumby

Location: Western District Health Service, Hamilton

Research centre: NCFH

Project description:

Online interventions have been used to reduce stigma among members of the Australian rural community who have been bereaved by suicide, attempted suicide, cared for someone who attempted suicide, have had thoughts of suicide, or been touched by suicide in some other way.

Intervention participants engage via a tailored digital pathway through which they experience personal stories from community members effected by suicide, video messages from stigma experts and health professionals, written information, links to resources and opportunities to set personal goals for stigma reduction and wellbeing. An optional element of participation is to write a digital message conveying a personal experience or message of support to others participating in the intervention.

This project will include thematic analysis of digital messages in order to identify behavioural indicators of stigma reduction, and inform future work to reduce stigma and prevent suicide in Australia's rural and farming communities. Day-to-day work will include developing an understanding of rural mental health, stigma and suicide risk; develop understanding of the Ripple Effect project; analysis of qualitative data; management of data using NVivo (or similar) software; and, developing skills in writing for publication.

Contact supervisor:
Dr. Alison Kennedy (School of Medicine): alison.kennedy@wdhs.net

Suitable for: Honours

Project reference: 1440

Comparing outcomes of bariatric surgery for public and private patients in rural Victoria

Supervisor/s: Susan Brumby, Jodie Nelson

Location: Western District Health Service, Hamilton

Research centre: NCFH

Project description:

In the regional/rural setting patients access bariatric surgery either as a private or public patient in a Public Hospital. Through the private pathway they can fund this surgery through their superannuation, private health insurance or through their personal funds. Patients in the 'Private' Pathway have a shorter turnaround from their initial referral to their date of surgery (8 months) in comparison to those who travel through the public pathway (2-3 years).

This research will focus on the outcomes of the comparative pathways between private and public patients. The term 'outcome' takes into account client perceived Quality of Life, percentage of Excess Weight Loss, reduction in the dosage or need for medications, and reversal of comorbidities.

The study will examine retrospective data and collect new data in the form of a post-operative questionnaire and some in-depth interviews. Investigation will include the difference in waiting periods between the 2 cohorts, demographics, level of education, co-morbidities, anthropometrics, number of appointments and education received by the health service pre surgery. Pre surgery data will have already been collected by previous Honours student.

Contact supervisor:
Dr. Susan Brumby (School of Medicine): susan.brumby@wdhs.net

Suitable for: Honours

Other considerations:

This project is subject to final approvals.