College of Health and Biomedicine

Guide to Honours and Postgraduate Projects in 2018

Why Do Honours or Postgraduate Study?

Honours is a single year of study unlike your undergraduate studies. You will be part of a research team and given something new and novel to investigate. So, you will have the thrill of discovering something new, while gaining skills which will lead you into a career in medical research if that is what you desire. If not, it is still a great experience and will put you ahead of other graduates in your area, and increase your employability.

There are many things that need to be considered before you choose an honours project – the laboratory you will work in, your supervisor, other support staff and especially the research topic! It is a busy year, so you should choose a project that you are interested in.

You may have already completed honours, or be thinking of progressing to a higher research degree. Victoria University also offers high quality Masters and Doctoral programs by research in sciences that are designed to further educate you such that you can become an independent and sought after researcher in your own right.

Thus, in this booklet, you will find some basic information as to the structure of the honours year, and an introduction to postgraduate study. More importantly, you will also find a list of the projects that staff will be offering to honours and postgraduate students. The projects in most cases can be adapted to either Honours or Postgraduate students, so take some time to consider what your interests are, and speak directly to the staff involved so that you can make an informed decision – after all, it's your future!

Honours Course Description

SHBM Bachelor of Science (Honours) – Biomedical and Health Science
SHNF Bachelor of Science (Honours) – Food Science

Please contact Professor Alan Hayes: Ph – 9919 4658, email – Alan.Hayes@vu.edu.au prior to contacting supervisors.

Course Coordinators

Professor Alan Hayes: Ph – 9919 4658, email – alan.hayes@vu.edu.au

Dr Catherine Kamphuis: Ph – 9919 2616, email – catherine.kamphuis@vu.edu.au

Prerequisites

A faculty honours score of at least a credit average over the three years of your undergraduate degree, with a score of 65% or better in third year level subjects is required to be eligible for honours. Acceptance is subject to the availability of supervisors and suitable projects, and placements are competitive.

Students should discuss their eligibility and potential research area with the Honours Coordinators. Any deviations to the prerequisites listed above are at the discretion of the Course Coordinator after advice from the confirmed supervisor and discussion with the Head of Program.

Objectives

The Science Honours degree program aims to develop the student's ability in the areas of independent thinking, critical evaluation, experimental design, data analyses, interpretation of data, oral and written reporting of data and laboratory skills. Additionally, it aims to improve the student's knowledge base in an area related to Biomedical Sciences, Health, Nutrition, Food Science or Paramedics at an advanced level.

Students are expected to learn and develop the following skills

- planning, implementing and communicating a research project
- critical evaluation of research papers
- understanding the role of a research scientist within a community setting
- interpretation of a body of knowledge leading to innovative research questions and testable hypotheses
- knowledge of appropriate experimental design and data analyses
- laboratory techniques sufficient to obtain a substantial body of work, either as results or optimisation of a methodological approach
- critical evaluation of one's own findings and their impact on current knowledge
- clear, concise and precise communication, both oral and written
- aptitude and ability to take on employment or further post graduate study without close supervision and with a high degree of responsibility

The Science Honours degree program consists of a coursework component and a research project component.

Coursework Component

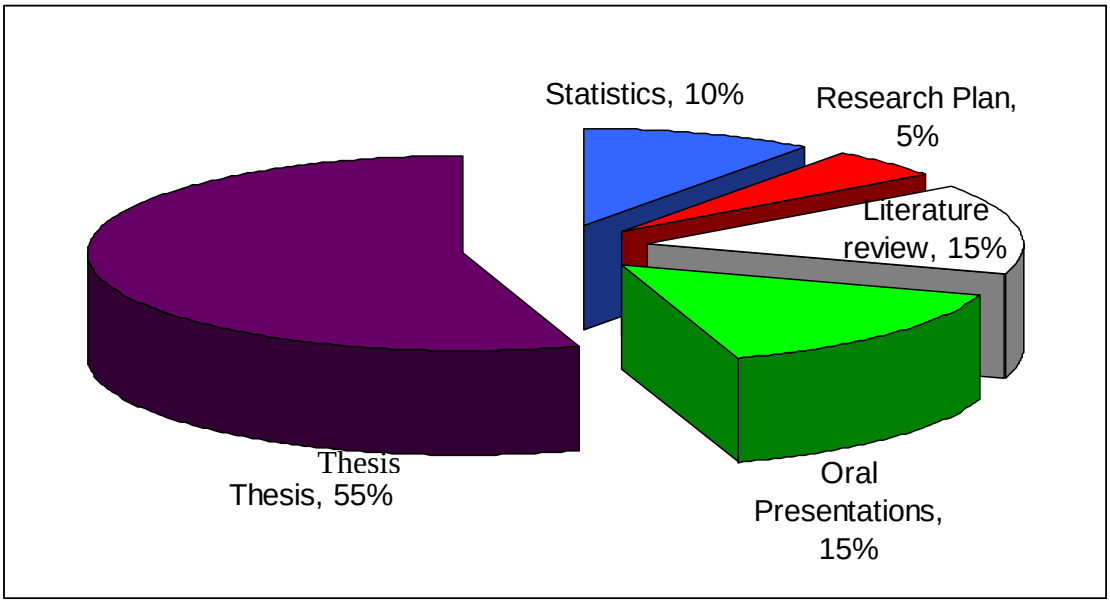
- Research Conduct, Ethics and Training
- Critical Review of Research Papers
- Oral and Written Presentation Skills
- Advanced Experimental Design and Statistics

Research Component

- Comprehensive review of scientific literature
- Original, supervised research project
- Oral presentations to school members

Assessed Items

- Advanced Experimental Design and Statistics
- Research Plan
- Written review of the literature
- Oral presentations covering background, research design and outcomes
- Written thesis at the end of the year, not exceeding 12,000 words (55% of the total mark for Honours as a whole) including defence of thesis



Postgraduate Research Course Description

SRHC **Master of Science (Research)**
HRNR **Master of Nursing (Research)**

UPFA Doctor of Philosophy (Integrated) in Food Sciences and Technology
UPMA Doctor of Philosophy (Integrated) in Medical and Biological Sciences
UPNA Doctor of Philosophy (Integrated) in Nursing and Midwifery
UPPA Doctor of Philosophy (Integrated) in Psychology
UPOA Doctor of Philosophy (Integrated) in Science
UPSA Doctor of Philosophy (Integrated) in Society and Culture

UPHF Doctor of Philosophy (Food sciences & Technology)
UPHM Doctor of Philosophy (Medical and Biological Sciences)
UPHN Doctor of Philosophy (Nursing & Midwifery)
UPAP Doctor of Philosophy (Psychology)
UPNS Doctor of Philosophy (Science)
UPAC Doctor of Philosophy (Society and Culture)

Full details about research degrees at VU can be found at www.vu.edu.au/postgrad

For further information and application details, please contact the Graduate Research Centre:
Ph - +61 3 9919 4522, Email - apply.research@vu.edu.au

or

The Director of Research and Research Training, Associate Professor John Price:
Ph – +61 3 9919 2046, Email – John.Price@vu.edu.au

A research degree requires a high level of self-motivation and independence of thought and action. Students are expected to plan and manage their own time in the work that they undertake. They must make more judgments about their research as their degree progresses. During the course of the degree the student will experience a definite shift from dependent to independent researcher.

A **Master by Research** degree is awarded after examiners are satisfied that the student has demonstrated:

- A thorough understanding of the relevant techniques in the field of research by both a thorough review of the literature and their application;
- Competence in the chosen field through judicious selection and application of methods to yield a significant body of work;
- Capacity to critically evaluate and effectively present this body of work

The thesis for a Masters by Research degree is expected to be between 30,000 - 60,000 words, and the time taken to complete a Master's degree is two years equivalent full-time.

The **Doctor of Philosophy (PhD) (Integrated)** provides an alternative pathway to a PhD for applicants who have not had previous research training and/or experience. With the assistance of an experienced research supervisory team, your original research will be conducted in an area that is of interest to you, relevant to industry and the community, and within VU's research focus areas.
In the first year of your degree, you will undertake intensive research training in the form of required coursework and a Year 1 thesis. Upon meeting the hurdle requirement (70% average across the Year 1 coursework units and 70% in the Year 1 thesis), you will conduct further original research at the frontier of its field in Years 2-4, leading to the presentation of a doctoral thesis within the normal 4-year period and to the award of Doctor of Philosophy.

The **Doctor of Philosophy (PhD)** degree provides training and education in research under appropriate supervision, with the objective of producing researchers capable of conducting research independently, at a high level of originality and quality. A doctoral student should uncover or create new knowledge by the discovery of new information, formulation of theories, development of new approaches, or the innovative re-interpretation of existing ideas, theories or approaches.

A Doctor of Philosophy degree is awarded after examiners are satisfied that the student has, through a systematic series of enquiry around a central research question, demonstrated:

- A deep and thorough understanding of the relevant techniques in the field of research;
- Competence in the chosen field through judicious selection and application of methods to yield a significant body of work;
- Capacity to critically evaluate and effectively present this body of work;
- Independence of thought and approach;
- Has made an original contribution to knowledge.

A PhD thesis is expected to be 60,000 - 100,000 words long, and the time taken to complete a PhD is three years EFT (36 months).

Research Projects Summary and Contacts

Research Project	Principal Investigator	Phone / E-mail
Role of methamphetamine in depression Methamphetamine (METH) speeds the messages travelling between the brain and body, leading to a rapid rush of intense euphoria, increased alertness, energy and confidence. In recent years METH use has increased dramatically. 7% of Australians over 14 years have used METH with 50% reported to have used ICE as the main form (the highest purity type of METH). METH use is associated with significant health harm. The daily number of METH related ambulance attendances between 2012-2013 increased by 88% in metropolitan Melbourne, up to an average of 3/day, and the increase was 198% in regional Victoria. The long-term effects of regular METH use leads to paranoia, violent behaviour, psychosis, anxiety and depression. Even when individuals stop METH, many of the symptoms persist for many years. The human immune system has powerful control over the brain. Hence, it is important to determine the inflammatory states, immune cell functionality and immune changes in the presence of METH. Understanding the immunological changes that cause significant neurological changes, will help us to better understand how to treat individuals who have stopped METH use. All this information will aid in better treatment modalities for such individuals (ie, reversal of immune damage, immune stimulation). **Design:** Isolate peripheral blood mononuclear cells (PBMCs) from blood received from the Red Cross Blood Service and separate immune cells (monocytes, T cells, B cells, NK cells). Stimulate with METH at various doses and time. A comprehensive analysis of immune changes to monocytes, T cells, B cells, NK cells, will be assessed in the presence of different doses of METH and for different durations. Cell surface markers, functional assays, cell molecular changes, cytokine and chemokine secretion and cell oxidative stress will be measured.	Professor Vasso Apostolopoulos	99192025 Vasso.Apostolopoulos@vu.edu.au
The role of the immune system during exercise and its effects in breast cancer patients Breast cancer continues to be the leading cause of death from cancer in developed countries in females and its incidence continues to rise. Despite improvements in treatment options over the past 30 years, the mean 5 year survival rate is still low, in particular in advanced stages. Physical inactivity is believed to be independent risk factor for the occurrence of cancer. Regular exercise is associated with better quality of life (QoL) and health outcomes, and reduces the risk of cancer. The Cancer Council Victoria recommends up to one hour of moderate or 30 minutes of vigorous physical activity (PA) daily to reduce the risk of cancer. Thirty to sixty minutes per day of PA reduces the risk of colon cancer by 30-40%, and breast cancer risk is decreased by 25-30%. It is clear that exercise may help prevent the development of certain cancers. Understanding the effect of exercise on immune function and measurement of its physiological benefits in patients with cancer is limited. Additional research is required to understand the mechanisms by which exercise affects immune function and its potential link to clinical outcome.	Professor Vasso Apostolopoulos	99192025 Vasso.Apostolopoulos@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Understanding excitation-contraction coupling in dysfunctional skeletal muscle. This project utilises a single muscle fibre approach, and standard molecular and biochemical techniques, to better understand excitation-contraction (E-C) coupling in normal and dysfunctional skeletal muscle. As such, mechanically-skinned muscle fibres will be used to investigate aspects of E-C coupling like voltage-sensor regulation of Ca^{2+} release, sarcoplasmic reticulum Ca^{2+}-handling, and myofibillar contractile function in animal models of normal and diseased states (e.g. Duchenne muscular dystrophy, obesity/type 2 diabetes, etc). The efficacy of various supplementation regimes to alleviate skeletal muscle dysfunction in these models will also be examined.	Dr Ronnie Blazev	99194594 Ronnie.Blazev@vu.edu.au
Walking to improve Mental Health at the workplace An increased awareness of the health benefits of walking has emerged with the development and refinement of accelerometer equipment. Evidence is beginning to highlight the value of promoting walking, particularly focusing on obtaining 10,000 steps per day. Workplace-based health promotion programs have become popular to engage large cohorts in increasing their daily physical activity in a sustainable and enjoyable way. Findings are now highlighting the positive health effects of these programs in terms of heart health, diabetes risk and lifestyle factors including weight and blood pressure improvements. Our available data from Stepathlon seem to indicate that such a program can also have a significant positive impact on mental health. Further research (data analysis) is needed for an in-depth examination whether such a relationship is dose dependent or mediated by other factors in this group based exercise.	Prof Maximilian de Courten	99192208 Maximilian.deCourten@vu.edu.au
Drug use epidemiology and surveillance in Australia: A review of process, technical and ethical challenges. Despite considerable investment in drug trend monitoring research in Australia, there has been little systematic review of existing approaches. Implementation of drug trend monitoring systems in any jurisdiction carries significant challenges. This project will review the key process, technical, and ethical challenges encountered in drug epidemiology and surveillance in Australia. Key themes to cover include: 1) Drug trend surveillance frameworks. 2) Sampling and recruitment of 'hidden'/'new' populations (e.g. internet samples, at risk youth, mature minors, cultural minorities etc). 3) Sensitivity, reliability and triangulation. 4) Utility of mixed-methods in surveillance research. 5) Applied ethical challenges in this field (e.g. obtaining free and informed consent to participation, the use of inducements to recruit subjects, protection of interviewees from violations of privacy and the risk of prosecution, safety of field research staff).	A/Prof Craig Fry	99195315 Craig.Fry@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Cycling-based mental health promotion initiatives: Origins, approaches and outcomes. Evidence has shown that while physical activity and exercise alone is not a panacea for severe forms of mental illness (e.g. clinical depression, PTSD, complicated grief, etc) it can have a positive impact on mental health and wellbeing. The evidence also suggests the mental health benefit from exercise is not universal – positive effects can vary as a function of illness severity, study group exercise experience (untrained, recreational, elite), exercise type (frequency, intensity, duration etc), and the chosen measure of mental health or wellbeing. While fewer studies have focused on the mental health benefits of cycling specifically, similar results are observed to those for other exercise in the areas of emotional and physical health and well-being. Outside the academic literature, there are plentiful anecdotal accounts about the mental health benefits of cycling for depressive and other mental health problems. Such positive accounts of this effect can be found amongst elite and amateur competitive cyclists, recreational riders, and cycling novices. A large number of community-based mental health promotion initiatives have emerged recently that utilise cycling as the mechanism of intervention and change (e.g. the Soldier On 'Trois Etapes' ride, Life Cycle UK 'Bike Minded' project, the Love Me Love You organisation's 'Ride with me for mental health', 'Knights of Suburbia', The Man Ride, and the 'Long Ride Home' initiatives). Cycling is also frequently utilised as a fundraising vehicle for a range of well-known men's health and mental health campaigns like Movember, SANE, RUOK? and the like. Despite the growing popularity of cycling in the mental health promotion area, and numerous anecdotal claims about its positive effects, the available empirical evidence has not yet clarified the exact psychological mechanisms behind those claimed positive effects. The aim of this project is to begin to gather evidence to help answer why cycling participation appears to have a positive impact upon mental health. The project will examine the impact of cycling upon a range of social psychological factors hypothesised to explain its positive effects (e.g. self-esteem, social skills and networks, identity and efficacy, distraction etc). It could involve a mixed methods empirical approach consisting of the collection of both qualitative (semi-structured in depth interview) and quantitative data (structured survey) from the participants and program staff / practitioners of recent cycling-based mental health promotion initiatives in Victoria.	A/Prof Craig Fry	99195315 Craig.Fry@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Identifying Novel Molecular Regulators of Skeletal Muscle Growth and Atrophy Muscle mass is lost in a range of conditions (e.g. injury or immobilization, diabetes, heart disease, cancer, and ageing) and can severely impair strength and physical activity levels, and contribute to physical inactivity-related disease. Thus, strategies aimed at preventing muscle loss and/or promoting muscle growth are essential to limiting disability and preventing disease. Therefore, we are undertaking a range of studies, to examine the potential for specific growth factors, signaling molecules, metabolic enzymes and/or transcription factors to stimulate muscle growth or promote muscle atrophy. The aim of these studies is to identifying potential pharmacological targets for preventing muscle atrophy/wasting and/or promoting skeletal muscle growth. These studies include the transfection of mouse muscles or cultured cells with recombinant DNA, Western blotting, immunohistochemistry, microscopy and enzyme activity assays.	Dr Craig Goodman	83958229 Craig.Goodman@vu.edu.au
Cactus dose study in Prader-Willi syndrome (PWS) hunger management To eat or not to eat, that is the question. However, in Prader-Willi syndrome (PWS), how to stop eating, is the question. PWS typically establishes hyperphagia (extreme hunger) in children with a PWS genetic deletion by 8 years of age. This will typically progress to obesity and then morbid obesity if unmanaged. PWS is the most common genetic disorder causing obesity today and investigations into PWS can help many other complex obesity related disorders. Importantly it has been shown by researchers at VU that the eating behaviour in children and adolescents with confirmed PWS may be managed by a natural supplement: the Indian cactus succulent Caralluma Fimbriata Extract (CFE) – known for hunger control. We are therefore interested in piloting this product against a placebo, in obese adults with PWS at a higher dose than the past. You can help us answer this very important question.	Dr Joanne Griggs, Dr Puspha Sinnayah & A/Prof. Michael Mathai	99192203 Joanne.Griggs@vu.edu.au 99192262 Puspha.Sinnayah@vu.edu.au 99192211 Michael.Mathai@vu.edu.au
Mechanistic animal study of gut-brain serotonin communication in Prader-Willi syndrome (PWS) The neurotransmitter 5-HT (5-hydroxytryptamine) is best known as serotonin. Serotonin is active throughout the body and is well known as a modulator of energy balance and mood. It also has an important role in appetite and satiety because of its action on a specific 5-HT receptor expressed in the brain's hypothalamus. A VU team studying mouse models has already established that a specific cactus supplement – known for hunger control; increases the activity of this receptor. Yet there is much more work to be done on the mechanistic pathway of this natural supplement. These investigations may include bidirectional gut-brain communication and afferents. This study is exciting and ground breaking specifically relevant to obesity, mood or appetite disorders and the hunger associated with Prader-Willi syndrome (PWS).	Dr Joanne Griggs, Dr Puspha Sinnayah & A/Prof. Michael Mathai	99192203 Joanne.Griggs@vu.edu.au 99192262 Puspha.Sinnayah@vu.edu.au 99192211 Michael.Mathai@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Effects of Vitamin D on skeletal muscle function Vitamin D is a secosteroid hormone that has effects on virtually all tissues of the body. Long known to regulate bone mass, a lack of vitamin D increases risk of falls and fractures. One-third of the population is vitamin D deficient with a staggering 75% being under the optimal level, leading to decreased muscle strength and fatigue resistance. Thus, a lack of vitamin D has also been linked to sarcopenia and obesity. Despite numerous correlations, there is very little specific information of how vitamin D affects muscle directly. With collaborators from The University of Melbourne, we are currently undertaking a series of studies that can involve cell culture, ex vivo muscle contractions and human performance to better understand the role of vitamin D in muscle function.	Professor Alan Hayes	9919 4658 / 8395 8227 Alan.Hayes@vu.edu.au
Investigating Possible Therapies for Sarcopenic Obesity Low muscle mass and poor function with ageing (sarcopenia) is associated with low quality of life, promotes a lack of physical activity and accumulation of fat, and is a strong predictor of morbidity and mortality. Given that obesity is occurring in greater proportions than ever, the two conditions, "sarcopenic obesity", are thought to complement each other to substantially increase the risk of morbidity and disability at earlier ages. We are currently developing an animal model of sarcopenic obesity that will complement our current clinical trial in older humans, to trial potential therapeutic compounds. Students will gain experience in animal surgery, muscle function, histological and morphometric analyses, as well as mitochondrial function and mechanistic studies. Students will also get the opportunity to contribute to ongoing human trials and/or analysis of existing databases.	Professor Alan Hayes	9919 4658 / 8395 8227 Alan.Hayes@vu.edu.au
Reducing hospital-acquired malnutrition through early identification of deteriorating nutritional status and application of a decision-support tool: a proof of concept study Malnutrition in a broader sense incorporates: protein energy malnutrition, under-nutrition, depletion, wasting and deficiencies of macro and micro-nutrients. Malnutrition acquired by hospitalised patients adversely affects physical and psychological health and impairs recovery from disease, increasing: mortality; complications; length of stay; and utilisation of healthcare resources. Malnutrition, acquired in hospital, is often unrecognised and untreated; nevertheless, it has been recently identified as a national priority because of its prevalence, high volume, impact on cost and because it is largely preventable. One of the aims of this project is to test a decision support and treatment initiation tool to support staff to make recommendations for appropriate nutrition interventions when necessary. The proposed research would include the development and conduct of semi-structured interviews with healthcare staff on the utility of the tools involved in order to all evaluate the effectiveness and potential for wider use.	Dr Liza Heslop	99192252 Liza.Heslop@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Effects of polarised light on immune cell activation Polarised light waves encompass visible light wavelengths in which the vibrations occur in a single plane. In recent years, the use of polarised light therapy has been reported to accelerate healing of a range of cutaneous lesions including deep dermal burns, pressure and diabetic ulcers. Although the precise mechanism behind how polarised light might stimulate wound healing is not currently understood, presumably the mechanisms may involve modulation of immune, endothelial and fibroblast cell activity. This research will investigate the effects of polarised light on immune cell activation. The research protocols involve immune cell culture, exposure of cells to polarised light and identification of cellular changes by flow cytometry.	Dr Maja Husaric & Dr Jim Kiatos	99191156 Maja.Husaric@vu.edu.au 99191191 Jim.Kiatos@vu.edu.au
The regulation of nutrient utilization and energy expenditure in obesity and diabetes I am interested in studying the adaptive changes in genes, proteins, enzymes, fuel storage and adiponectin. Leptin, GPCR and endocannabinoid signalling in tissue, particularly skeletal muscle. Projects will involve the study of the effects of obesity and diabetes in: leptin, adiponectin, GPCRs, endocannabinoids and different free fatty acids on muscle cell energy metabolism. Understanding the abnormalities that are present in the skeletal muscle of obese and diabetic patients are essential to our development of treatments for these conditions. Leptin and adiponectin resistance and abnormalities in the endocannabinoid system in skeletal muscle and other tissues/organs loom as key targets to assist in the understanding of the obese and obese diabetic skeletal muscle phenotype.	Professor Andrew McAinch	99192019 Andrew.McAinch@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Nutrition and Dietetics to optimise recovery in high performance sports and/or improve the health of disadvantaged populations. Sports projects will involve the study of the effects of different nutritional strategies following recovery from particularly endurance performance. Understanding how our body recovers from these exercise bouts and thus how to best take full advantage of nutritional interventions to enhance recovery is essential to maximise performance. I am interested in studying the changes in genes, proteins, enzymes, fuel storage and adiponectin and endocannabinoid signalling in tissue, particularly skeletal muscle during recovery from exercise. Health projects will involve the study of the effects of different nutritional and educational strategies to improve the health of particularly the elderly or disadvantaged youth. Understanding how various interventions can improve the health outcomes of these population groups are essential. These studies will involve looking at the longer term outcome of interventions in the food supply to the elderly or looking at improving cooking skills in the youth. Thus a background in nutrition will be essential.	Professor Andrew McAinch	99192019 Andrew.McAinch@vu.edu.au
Are community pharmacists equipped to provide nutrition advice? The Australia's Health 2016 report states that in 2013–14, primary health care accounted for approximately 38% (or $55 billion) of health expenditure. The report also states that around 1 in 3 hospital admissions from chronic diseases are preventable. Many chronic diseases are amenable to preventive measures such as improvements in dietary behaviour. These changes, together with timely and effective medical treatments, are important in improving chronic disease health outcomes. General Practitioners are described as the 'gatekeepers of primary care'. However, consumers interact with community pharmacists up to 4 times more often than GPs, with an average of 12 to 15 interactions each year. As members of one of the largest and most accessible healthcare professions, pharmacists are ideally located to play a key role in disease prevention by educating the public about modifiable behaviours such as healthy dietary intake and physical activity. However, pharmacists and other primary health professionals experience barriers to the provision of nutrition care, including a lack of training and confidence in this area, access to resources for continued professional development. In collaboration with researchers at Griffith University, Australia and Ulster University, UK; the aim of this project is to assess the nutritional knowledge, attitudes and practices of community based pharmacists at different stages of their careers.	Dr Helen McCarthy	9919 2390 Helen.mccarthy1@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Nutrition status of children admitted to hospital – what is the extent of the problem? Malnutrition, in the form of under-nutrition, in hospital is recognised to have significant clinical and financial implications. Clinical benchmarking and audit of nutrition related practice is common place across the world within adult and elderly care. However, there is a distinct lack of evidence, research and guidelines regarding under-nutrition in children. From 2011-2014, a team from the University of Ulster (UK), undertook the Children's Nutrition Survey (CNS), which gathered information on current nutrition related practice within children's units across the UK and Ireland. In addition, anonymous nutrition related data for children admitted to children's units was gathered. This has provided the largest data set available for estimating the prevalence of malnutrition (both obesity and under-nutrition) in children admitted to hospital. As part of an on-going initiative the CNS will continue to gather data from inpatient units in the UK and Ireland, and expand to look at outpatient facilities. It is also hoped to incorporate centres from across Australia and New Zealand in the future. This project aims to re-evaluate data available from the 2011-2014 surveys and add to this data set with new data collected within 2017.	Dr Helen McCarthy	9919 2390 Helen.mccarthy1@vu.edu.au
Can exercise prevent the negative metabolic effects of shift work? Exposure to shift work is common and increasing, with more than 18% of the Australian workforce (over 1.5 million people) working outside the "normal" working hours of 8am to 6pm, with similar proportions in other countries. Rates of type 2 diabetes and obesity are very high among shift workers, even after controlling for lifestyle and socioeconomic status. We have recently found that a roster of simulated night shift work of only 4 nights leads to a statistically and biologically significant 25% reduction in insulin sensitivity in young healthy individuals. This was independent of sleep and diet/fat intake which were controlled. It is very important to identify safe interventions to overcome such negative effects of shift work. The aims of this project are to determine whether exercise can overcome the negative metabolic effects of shift work in individuals who undertake a 4 day roster of simulated night shifts.	Professor Glenn McConell (ISEAL, College of Sport and Exercise Science)	99199472 Glenn.McConell@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
How does nitric oxide increase insulin sensitivity after exercise? The number of people with diabetes in Australia has been described as an epidemic having tripled since 1981. Type 2 diabetes (T2D) accounts for over 85% of people with diabetes. Most people are aware that "exercise is good for diabetes" and it is often assumed that this is because exercise training causes weight loss. However, each bout of exercise increases insulin sensitivity and the extent of this increase is essentially normal in people with T2D, highlighting the powerful and alternative role of exercise in regulating this fundamental physiological process. Decreased insulin sensitivity is believed to be the underlying defect in a range of life style related diseases such as hypertension, dyslipidaemia, T2D and impaired cognitive function. Thus, understanding how exercise acts to increase insulin sensitivity has broad clinical implications. We have found for the first time that skeletal muscle nitric oxide (NO) is required for the increase in insulin sensitivity after exercise in healthy humans as well as following contraction in isolated mouse muscle. The aim of this project is to elucidate the relative contributions of blood flow and muscle fibres to the NO-mediated increase in insulin sensitivity after contraction/exercise and the mechanisms involved. This line of work is resulting in a paradigm shift in our understanding of how exercise increases insulin sensitivity with our recent work published in the very prestigious journal Diabetes.	Professor Glenn McConell (ISEAL, College of Sport and Exercise Science)	99199472 Glenn.McConell@vu.edu.au
Nutrition and female fertility Female fertility is dependent on a number of factors including the cycling of the ovarian hormones oestrogen and progesterone, which regulate follicular maturation and ovulation. By tracking urinary levels of ovarian hormones, we can predict when ovulation occurs and monitor the effect of nutritional interventions on the regularity of the menstrual cycle. This knowledge will allow us to apply nutrients that are known to influence ovarian hormones to improve female fertility.	A/Prof Michael Mathai	99192211 Michael.Mathai@vu.edu.au
Tocotrienols and cardio-metabolic health Tocotrienols are relatively rare members of the vitamin E family that are known to greatly reduce hypertension, improve metabolic health and increase exercise capacity in animal studies. However, they have a low bioavailability when ingested orally, which limits their application in humans. We will test the effectiveness of a novel means of linking the tocotrienols to a carrier to improve their bioavailability and hence, their effectiveness in treating metabolic diseases, improving cardio-metabolic health and increasing exercise capacity.	A/Prof Michael Mathai	99192211 Michael.Mathai@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Targeting Fatty Acid Synthase as a New Therapeutic Approach to Osteosarcopenia There is a subgroup of individuals with sarcopenia who also suffer from osteopenia/osteoporosis, a syndrome known as osteosarcopenia. Older persons suffering from osteosarcopenia are frailer and show a higher prevalence of falls and fractures. Fat infiltration is a frequent finding in osteoporosis, sarcopenia and osteosarcopenia. The role of fat infiltration in the pathophysiology of musculoskeletal diseases is intriguing. This fat suffers a toxic shift in which adipocytes secrete more fatty acids (predominantly palmitic acid [PA]), producing lipotoxicity. We hypothesise that inhibition of PA synthesis by adipocytes will have a dual anabolic effect on muscle and bone. The main objective of this project is to test the effect of fatty acid synthase inhibition *in vitro* and *in vivo* as a new therapeutic approach to osteosarcopenia, and whether this treatment increases muscle mass and function.	Associate Professor Damian Myers (with Professor Alan Hayes & Professor Gustavo Duque (Director AIMSS, UoM)	9919 2652 Damian.Myers@vu.edu.au
Understanding mechanisms underlying side-effects of anti-cancer chemotherapy Anti-cancer chemotherapy alone, or in combination with radiation, is given before or after surgery to most patients. Although chemotherapeutic drugs increase survival rate in patients with metastatic CRC, they have a wide spectrum of acute and long-term side-effects on gastrointestinal, cardiovascular and skeletal muscle functions. Severe toxic effects of anti-cancer drugs on the nervous system controlling functions of these organs might be a major factor contributing to the adverse symptoms experienced by patients. We are investigating the mechanisms underlying the side-effects of chemotherapeutic drugs and develop novel therapies to minimise these side-effects. Research projects aim to develop and test novel therapies in various models of cancer to attenuate neurotoxicity caused by chemotherapy and alleviate the side-effects of anti-cancer chemotherapy.	A/Prof Kulmira Nurgali	83958223 Kulmira.Nurgali@vu.edu.au
Development of novel therapies to alleviate enteric neuropathy associated with gastrointestinal inflammation Inflammatory bowel disease (IBD), comprising two main pathologies, ulcerative colitis and Crohn's disease, affects more than 80,000 Australians. There is no cure for IBD. Damage to the enteric nervous system underlies some of the symptoms and recurrence of the disease. The main aim of our research is to develop and test novel therapies that have anti-inflammatory and neuroprotective effect on the enteric nervous system, and can alleviate symptoms of gastrointestinal inflammation. Research projects involve testing novel anti-inflammatory and neuroprotective drugs, development of nanoparticles, testing mesenchymal stem cells for the treatment of IBD.	A/Prof Kulmira Nurgali	83958223 Kulmira.Nurgali@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Identification and Characterisation of Molecular Mediators of Cancer Metastasis Cancer accounts for 1/3 of all Australian deaths and is a major social and economic burden. The prime feature of treatment failure as well as the cause of majority of death in cancer patients is due to the spread of the cancer to other sites within the body, a process termed metastasis. Major sites of metastasis include bone, brain, lungs, kidney and liver and although metastasis is a major clinical problem, still much is to be learned regarding the molecular drivers of metastasis and the translation of this knowledge to the generation of effective anti-metastatic cancer therapeutics. To address this, we have used a number of isogenic cancer cell lines with differing levels of metastatic potential and using gene expression analysis we have identified a number of putative molecular mediators of metastasis and therefore potential therapeutic targets of metastasis. This project will utilise a wide-array of molecular, cellular, and biochemical approaches as well as the use of *in vivo* metastatic models, to examine the role of these molecules in important cell biological features of the metastatic cancer cell such as seeding, survival, proliferation, migration, invasion and intracellular signaling pathways. Moreover, this project will also seek to identify and test inhibitory compounds towards these putative 'drivers of metastasis' to provide the basis for the development of novel anti-metastatic therapeutics. It is expected that this project will contribute to the identification of novel drivers of metastasis as well as leading to the isolation of new anti-metastatic therapeutics. It will also provide the successful candidate with intensive training in the areas of cancer cell biology, molecular biology, cell signaling, protein biochemistry and experimental *in vivo* metastatic cancer models.	Associate Professor John Price	9919 2046 John.Price@vu.edu.au
Characterisation and targeted therapies against chemotherapy-induced mitochondrial dysfunction & skeletal muscle atrophy Chemotherapy is the leading intervention against cancer. Albeit effective, chemotherapy has a multitude of negative side-effects, including muscle wasting and fatigue, which considerably reduces patient quality of life and life expectancy. There is evidence to suggest that normal skeletal muscle turnover and repair processes are compromised by chemotherapies, which potentiates skeletal muscle dysfunction and wasting. Importantly, mitochondria have emerged as key players in the pathogenesis of a variety of diseases with mitochondrial dysfunction and toxicity manifesting as skeletal muscle dysfunction. Our data suggests that mitochondria are inadvertent targets of chemotherapeutic agents, which contributes to skeletal muscle dysfunction and wasting. This project will involve exposing cells and appropriate animal models to a range of chemotherapy agents to establish their mechanisms of action on mitochondria and subsequent skeletal muscle dysfunction. We will then use mitochondrial targeted therapies to improve mitochondrial viability and function, advancing finally to establish their efficacy in cancer models. We will assess mitochondrial metabolism and skeletal muscle form and function. Western blotting, immunohistochemistry, microscopy and enzyme activity assays will also be performed.	Dr Emma Rybalka	8395 8226 Emma.Rybalka@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Re-purposed pharmacological agents for rapid therapeutic translation in Duchenne Muscular Dystrophy Duchenne Muscular Dystrophy (DMD) is a devastating degenerative neuromuscular disease that is currently incurable, poorly treated and in all cases fatal. We have importantly established that mitochondrial dysfunction is a key feature of the myopathy, and that supporting cellular metabolism with energy-promoting supplements can ameliorate disease progression. Translating a novel drug from "benchtop to bedside" is arduous and expensive – on average it takes 15 years and US$2.6 billion to translate a new medicine to patients. However, drug re-purposing (the investigation of already approved drugs to determine their safety and efficacy for treating a different condition) means they can be ready for clinical trials relatively quickly, expediting their review by regulatory bodies, and if approved, their integration into health care. In this project, we aim to determine whether two existing compounds have the potential to be re-purposed for DMD. The aim of this project is to investigate known pharmacological modulators of mitochondrial function and oxidative stress that are already undergoing clinical testing in humans with the view to re-purposing them for DMD. The project will primarily use mouse models of DMD to pre-clinically evaluate skeletal muscle quality, function, histology, morphometry and mitochondrial metabolism. It will also involve culturing of human DMD muscle cells to explore mechanisms of action. Western blotting, immunohistochemistry, microscopy and enzyme activity assays will also be performed.	Dr Emma Rybalka	8395 8226 Emma.Rybalka@vu.edu.au
Energy Balance in Metabolic Health and Disease Regulation of energy balance is important for maintenance of body weight and prevention of a number of lifestyle diseases. Disruption to energy balance (positive or negative) can have significant impact on health, but also the development of disease. Our research focuses on the manipulation of energy balance in the understanding, prevention and treatment of lifestyle related diseases. The research programs involve molecular, cellular and whole body level laboratory techniques in animal and human models.	Dr Chris Stathis	99194293 Christos.Stathis@vu.edu.au
Nutrition supplementation and Exercise Performance and Health Nutritional supplements such as creatine, beta alanine, ribose, caffeine have many benefits on performance but also health. Our research focuses on the impact of nutritional interventions on performance and health related outcomes. The research programs involve animal experiments or human trials.	Dr Chris Stathis	99194293 Christos.Stathis@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Efficacy of Natural Product in the Treatment of Colorectal Cancer Colorectal cancer (CRC) is the second most common cancer affecting Australians and the mortality rate remains high. The currently prescribed treatment for patients in the advanced stages of CRC is chemotherapy. However, this is associated with numerous adverse side effects. Our preliminary *in vitro* studies have shown that krill oil can inhibit cancer cell proliferation and induce apoptosis. This study will test the anti-cancer efficacy of krill oil in pre-clinical animal models of colorectal cancer and investigate the underlying mechanism of the anti-cancer properties of this natural product. Students will gain experience in animal surgery, histological and molecular studies.	Associate Professor Xiao Su	99192318 xiao.su@vu.edu.au
Possible Therapeutic Roles of Emu oil in Diabetes Type 2 diabetes (T2D) accounts for 85–90% of all diabetes. The lifestyle changes and pharmacological approach have revealed efficacy in reducing the incidence. However, a significant number of patients show, or develop over time, decreasing effectiveness of pharmacotherapy. Dietary, complementary or alternative therapeutic approaches for T2D are therefore growing in popularity Emu oil contains high amounts of polyunsaturated fatty acids and antioxidants. The largest fatty acid component is oleic acid, a monounsaturated ω-9 fatty acid (18:1), comprising >49.1% of the total fatty acids. Oleic acid was found to reverse the inhibitory effect on insulin production caused by the inflammatory cytokine (TNF-a) in both in vitro and in vivo systems. It has also proven useful in insulin resistance and in the prevention and treatment of diabetes. This project will investigate the role of emu oil in the treatment of diabetes. Students will gain experience in animal surgery and metabolic data analysis, histological and molecular studies.	Associate Professor Xiao Su	99192318 xiao.su@vu.edu.au
The role of heat shock factor-1 in renal cell carcinoma proliferation, migration and invasion Renal cell carcinoma (RCC) is one of the ten most common cancers affecting Australians. In 50%of RCC patients, by the time of diagnosis, the cancer has metastasised to other organs . As RCC does not respond well to chemotherapy, radiation or hormone treatments, patients have a very poor prognosiswith average survival rates of only 7-11 months Clearly the lack of efficacious therapeutic intervention regimes in RCC highlights the need for the design of new therapies. Heat shock factor 1 regulates the expression of chaperone proteins that enhance cell survival during heat stress by preventing protein misfolding and aggregation. However, in a number of different cancers including breast, lung and colon cancer, heat shock factor-1 promotes cellular transformation, growth and metastasis and is associated with poor patient outcomes . The current study will assess whether Heat shock factor 1 expression in renal cell carcinoma correlates with patient outcomes. It will investigate the effect of inhibiting heat shock Factor-1 in renal cell carcinoma cell lines via a novel peptide on proliferation, migration and invasion	Dr Elizabeth Verghese & Associate Professor John Price	99192557 Elizabeth.Verghese@vu .edu.au 9919 2046 John.Price@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
The Potential role of Kif3a in renal cell carcinoma proliferation, migration and invasion Renal cell carcinoma (RCC) is one of the ten most common cancers affecting Australians. In 50%of RCC patients, by the time of diagnosis, the cancer has metastasised to other organs . As RCC does not respond well to chemotherapy, radiation or hormone treatments, patients have a very poor prognosiswith average survival rates of only 7-11 months Clearly the lack of efficacious therapeutic intervention regimes in RCC highlights the need for the design of new therapies. One potential therapeutic target is the cilium localised protein Kif3a. In the kidney, renal cilia are sensory organelles that regulate epithelial cell proliferation and differentiation. The Kif3a protein is normally involved in the construction of the cilium. However in renal cell carcinoma when cilia are absent, it appears that Kif3a may promote tumour growth and metastasis. This is supported by preliminary data from renal cell carcinoma samples from 19 female patients and 40 male patients shows that high expression of Kif3a correlates with lower patient survival rates. The current study will assess whether kif3a in renal cell carcinoma correlates with patient outcomes. It will investigate the effect of inhibiting kif3a in renal cell carcinoma cell lines on proliferation, migration and invasion.	Dr Elizabeth Verghese	99192557 Elizabeth.Verghese@vu .edu.au
Investigating the effects of genetic variants on expression of fat metabolism genes in humans Skeletal muscle is an important site for the storage and breakdown of triglycerides (main constituent of fat). Triglyceride in muscle (Intramuscular triglyceride, IMTG) content is influenced by excess nutrition and exercise, and a higher IMTG content is associated with reduced insulin sensitivity and poorer mitochondrial function. It is known that alterations in the expression of genes involved in fat metabolism, such as lipoprotein lipase, are associated with multiple diseases including diabetes and obesity. Recently, variations on the gene (genetic variants) have been reported to affect gene expression. The aim of the current project is to explore genetic variants on fat metabolism genes that are influenced by high-intensity exercise. Students will gain experience in exercise testings, genotyping, muscle physiology and histological analyses, as well as mitochondrial function analyses. Students will also get the opportunity to contribute to ongoing exercise intervention and/or analysis of existing data.	Dr Xu (Sean) Yan	9919 4024 Sean.Yan@vu.edu.au

Research Project	Principal Investigator	Phone / E-mail
Do genetic variants affect blood glucose response to exercise? Type 2 diabetes (T2D) is characterised with insulin resistance and dysregulated glucose homeostasis. Exercise is a powerful stimulus to increase insulin sensitivity and glucose metabolism. Despite the proven health benefits of exercise, it is clear there is considerable individual variability in the response to similar exercise, including the response in glucose metabolism. Different lines of research indicate there is a strong genetic component. Identifying and understanding gene variants contributing to the individual response in glucose metabolism via exercise is challenging, but has exciting potential implications for "personal medicine" and the future development of individualised exercise programs to treat diabetes. The aim of the current project is to evaluate the effects of genetic variants (related to exercise performance) on blood glucose response after a single bout of high-intensity interval exercise. Students will gain experience in exercise testings, blood analysis, as well as genotying. Students will also get the opportunity to contribute to ongoing exercise intervention and/or analysis of existing data	Dr Xu (Sean) Yan	9919 4024 Sean.Yan@vu.edu.au
Dietary Interventions To Prevent Cardiovascular Disease Cardiovascular disease remains a burden for the elderly, which is usually caused by poor diet in middle age. You will be responsible in determining what factors can be added to food to reduce this burden. Students will use gold standard methods, such as organ baths, immunohistochemistry, stereology. Students will be able to continue their studies into a PhD.	Dr Anthony Zulli	99192768 Anthony.Zulli@vu.edu.au