Faculty of Health Sciences & Medicine

Honours Program
Information Booklet

2012

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Honours Program 2012

Introduction

The School of Health Sciences Honours program is a 90CP supervised, one-year program of independent research and study culminating in the production of a research thesis and presentation of a research seminar. Students undertake a program of course-work and research in which they conceptualise, plan, organise, undertake and report on an independent research project, whilst being supervised by a member of academic staff.

The Honours Program is offered as an add-on to the following degree programs:

- Bachelor of Biomedical Science
- Bachelor of Exercise Science
- Bachelor of Forensic Science
- Bachelor of Health Sciences
- Bachelor of Medical Laboratory Science
- Bachelor of Sports Management
- Bachelor of Sports Science

The program is a three semester course of study which commences ONLY in January semester and concludes in November each year.

Aims of the Honours Degree

The School of Health Science Honours program is designed primarily to provide graduates with the skills necessary to pursue in career in research. An Honours degree is an essential prerequisite for entry into postgraduate research Masters and PhD programs. Completion of an Honours year will also help graduates gain employment in their discipline. Honours graduates are highly valued by employers as they have demonstrated skills in written and oral communication, critical thinking and interpretation, and project management. Most research assistant positions require applicants to have successfully completed an Honours year.

The Honours program within the Faculty of Health Sciences & Medicine aims to help graduates develop skills in:

- planning and conducting research
- written and oral professional / scientific communication
- writing grant applications
- information retrieval and organisation
- project management

Structure of the Program

The Honours program consists of 90 credit points comprising both coursework and research components scheduled as follows:

Jan (121)	HLSC41-140: Research Analysis & Communication (15CP) HLSC41-141: Research Preparation & Design (15CP)
May (122)	HLSC44-137: Honours Thesis A (30CP)
Sept (123)	HLSC44-138: Honours Thesis B (30CP)

Coursework Components

HLSC41-140: Research Analysis and Communication (15CP)
January Semester

The successful conduct of research requires advanced abilities in analysis and interpretation of data, critical thinking and written and oral presentation. This subject will build on skills developed in the subject "Research Preparation & Design" to support Health Sciences Honours students as they progress into the second semester of their program. A thorough coverage of mathematical and statistical procedures required to support both the project design and data analysis will be provided. Parametric and non-parametric statistical methods will be examined including t-tests, analysis of variance (ANOVA), correlation and regression. Workshops will actively develop students' skills in a variety of communication formats including the writing of discipline-specific journal articles, short abstracts and funding proposals. Students will also participate in regular "journal club" sessions where the findings of key research papers are critically reviewed and debated.

HLSC41-141: Research Preparation and Design (15CP)
Jan semester

This subject is designed to provide the framework and skills necessary for Honours students to successfully commence a research project in the Health Sciences. Students will work closely with the Honours convenor and individual project supervisors to develop their research topic, formulate their aims and hypotheses and consider the significance of the project. Workshops will enable students to search for and retrieve, interpret and begin to critically evaluate the relevant literature in their field. Research ethics processes will be discussed and debated, and students will be assisted to complete ethics applications where appropriate for their study. Students will also review various research design strategies and identify appropriate methods for conducting their project and analysing their expected data. Finally, students will be supported to prepare and present a detailed research proposal to the Faculty.

Research / Dissertation Component

HLSC44-137: Honours Thesis A (30CP) - May semester

HLSC44-138: Honours Thesis B (30CP) - Sept semester

These subjects constitute the major assessable component of the Honours candidature. It will be assessed according to the detailed assessment criteria provided on the basis of an evaluation of the thoroughness of the literature review, the validity and reliability of the data collected, as well as the subsequent analysis, interpretation, presentation and discussion of the results. As part of the assessment procedures, candidates will be required to prepare a full dissertation (80% of the assessment weighting) and a final seminar (20%) in which the research project and associated results will be presented and defended.

Application for admission

The program is available to students who have completed a relevant Bachelor's degree. An application for admission to the Honours program and all relevant supporting documentation must be submitted online to Bond University at **https://apply.bond.edu.au/.**

Applications close on **Friday 25 November 2011** (end of Week 11 of semester 113).

Selection

The candidate's application for admission to the Honours program is considered by the Honours Program Convenor in consultation with proposed/potential supervisors and the Head of School. In evaluating an application for admission to the Honours program, the following will be considered:

(i) The undergraduate record of the applicant, and the completion (or expected completion) of a relevant Bachelors degree. The standard for admission into the Honours program is an overall GPA of 2.0 (credit), with a GPA of at least 2.5 in 40 credit points of relevant subjects taken over the last 2 semesters of the undergraduate program.

A candidate whose GPA is below that required for admission into the Honours program may apply to the Dean of the Faculty for special consideration, but the candidate is unlikely to be offered a scholarship.

(ii) Candidates must have completed at least 60 credit points of study related to the general area of the proposed Honours research project in the last three semesters of their Bachelors degree.

(iii) Candidates must have been awarded a Bachelors degree that is related to the proposed Honours research project within the previous three years.

Approval of dissertation topic and supervision

All Honours dissertation topics and Supervisor(s) are approved by the Faculty prior to being offered to students.

Fees & Scholarships

In 2012 the Faculty will be offering Scholarships for 25%, 50% or 100% waiver of tuition fees.

Applicants may not all receive the same value of Scholarship while some applicants may not be offered a Scholarship.

Note that applications received after the closing date may not be considered for a scholarship.

Students receiving less than 100% Scholarship will be charged the standard tuition fee minus their percentage of Scholarship awarded.

Students who do not obtain a scholarship will be charged standard tuition fees in full.

FEE-HELP

Fee-help may be used to off-set the costs of fees associated with the Honours program. FEE-HELP is an interest-free loan scheme administered by the Australian Taxation Office and available to Australian citizens and those holding a permanent humanitarian visa to help pay tuition fees. For more details of the loans available visit www.goingtouni.gov.au.

Grades Awarded

The degree with Honours is awarded in the following classes: Honours Class I (85-100%), Honours Class IIA (75-84%), Honours Class IIB (65-74%), Honours Class III (50-64%).

Study Load & enrolment status

The HSM Honours program comprises 90CP over three semesters. Each semester has an enrolment of 30CP.

Discipline: Biomedical Sciences

Project Title: The role of tachykinins in a rat model of a diabetic bladder dysfunction.

Supervisor(s): Associate Professor Donna Sellers, Prof Russ Chess-Williams

Background

Diabetic patients suffer a range of complications which can severely affect their quality of life. Over 50% of patients develop some form of bladder dysfunction, ranging from poor bladder sensation and an inability to empty the bladder to bladder overactivity resulting in urgency and frequency of urination and urinary incontinence. The exact mechanisms underlying diabetic bladder dysfunction are not clear, and the current pharmacological treatments are hampered by adverse effects. Thus there is a need to develop a better understanding of this condition, which may ultimately lead to novel or more effective treatments.

Recently the tachykinin family of peptides, eg. neurokinins, have been shown to play a role in regulating bladder function and have been implicated in bladder dysfunction.

Aims - The aim of the study is to investigate the role of tachykinins in a rat model of diabetic bladder dysfunction.

Significance – The findings will help us to understand the role of tachykinins in diabetic bladder dysfunction.

Methods - The study will use the streptozotocin-induced rat model of type I diabetes mellitus, which will be used at 1 and 4 weeks (acute) and 12 weeks (chronic), and is currently being used in the Bond Urology Group. *In vitro* tissue bath studies of isolated strips of bladder will be used to investigate the role of tachykinins in mediating spontaneous phasic activity of the bladder, as well as tachykinin-induced contractile responses and the receptor subtypes involved. There will be opportunities to play an active part in the animal model procedures and the skills developed will include tissue dissection and *in vitro* pharmacology.

Outcomes - A greater understanding could ultimately lead to better therapies to treat disorders such as bladder overactivity and urinary incontinence, which are common complications of this disease.

Project Title: **A role for testosterone in bladder function?**

Supervisor(s): **Associate Professor Donna Sellers, Dr Catherine McDermott, Professor Russ Chess-Williamns**

Background

Age-related health problems are becoming more prevalent. A common age-related problem is overactive bladder (OAB), which is a distressing condition that leads to urgency and frequency of urination and can result in incontinence. The mechanisms underlying OAB are still not clear. However, in men, testosterone levels decrease by 1% per year after the age 40, and around 12% of men over 40 show androgen deficiency. Erectile dysfunction and enlargement of the prostate have been considered to be the main urological disturbances associated with the decline in androgen status in ageing men. However, recently a role for testosterone in bladder dysfunction has been suggested and it is possible that age-related alterations in bladder function, such as OAB, are a consequence of reduced androgen levels.

The precise effects of testosterone on bladder contractility are not clear and there have been no studies on its effect on the urothelium, the lining of bladder, recently found to play an important role in bladder function by releasing chemical mediators that influence the underlying muscle and nerves.

Aims - The aim of the study is to investigate the role of testosterone in normal bladder function using a mouse model of low testosterone and a urothelial cell culture model.

Significance – The findings will help our understanding of the role of testosterone in bladder function, particularly on the bladder urothelium.

Methods

In vitro tissue bath studies of isolated strips of bladder from control and castrated mice (low testosterone) will be used to investigate the role of testosterone on bladder contractility and function of the urothelium. Urothelial cells cultured under physiological or low testosterone conditions, as well as cells subjected to a simulated decline in testosterone, will be used to study the effect of testosterone on mediator release from the urothelium (ACh, ATP, and prostaglandins), using standard bioluminescent and enzyme immunoassays. There will be opportunities to play an active part in the animal model procedures and the skills developed will include tissue dissection, *in vitro* pharmacology, cell culture and use of mediator assays.

Outcomes - A greater understanding could ultimately lead to better or novel therapies to treat age-related bladder dysfunction such as OAB, which places a huge burden on healthcare resources in Australia and across the world and severely impairs quality of life of patients.

Project Title: How does the bladder know it is full? Investigating the role of mechanosensitive epithelial ion channels

Supervisor(s): Assistant Professor Peter Johnson, Assistant Professor Catherine McDermott

Background

Bladder control disorders affect over 4 million Australians. Many of these disorders are associated with alterations in bladder nerve sensation and control of voiding reflexes.

However, the mechanisms by which the bladder senses fullness are not well established. This project will investigate the hypothesis that bladder wall stretch / pressure activates mechanosensitive epithelial sodium channels (ENaC) and TRP channels, leading to release of ATP and NO to activate sensory nerve pathways.

Aims - The aim of the study is to investigate the role of testosterone in normal bladder function using a mouse model of low testosterone and a urothelial cell culture model.

Significance – This project will provide essential knowledge that can then be applied to examine alterations in channel function in bladder disease, and the potential use of ENaC and TRP blockers as effective treatments.

Methods

Electrophysiological studies with Ussing chambers will be conducted to measure the ionic currents that occur across the uroepithelium in response to stretch / pressure, and assays will be performed to measure correlations with ATP and NO release. The effect of drugs which selectively block ENaC and TRP channels on mediator release will then be examined. Effects of inhibition of these channels on spontaneous and nerve-evoked contractility of bladder urothelium and smooth muscle will also be investigated.

Outcomes - This project will provide essential knowledge that can then be applied to examine alterations in channel function in bladder disease, and the potential use of ENaC and TRP blockers as effective treatments.

Project Title: **Effect of active constitutes from chilli peppers on vascular function**

Supervisor(s): **Dr Peter Johnson, Professor Russ Chess-Williams**

Background

Capsaicinoids, the primary active constituents of chilli peppers, have a number of putative beneficial effects on cardiovascular function including cardioprotection and antihypertensive actions. These are generally assumed to be mediated via activation of TRPV1 receptors and release of modulators such as CGRP and substance P. While capsaicin is known to dilate blood vessels, the mechanisms responsible are the subject of recent controversy.

Aims - The aim of the study is to investigate the therapeutic use of capsaicinoids, and provide important information for the development of new drugs for cardiovascular disease.

Methods

This study will use isolated pig coronary arteries as a model for investigating the signalling pathways responsible for mediating the vasoactive effects of capsaicin and related compounds.

Outcomes - The results obtained will provide rational evidence for the therapeutic use of capsaicinoids, and provide important information for the development of new drugs for cardiovascular disease.

Project Title: **The role of muscarinic receptor subtypes in prostatic cancer growth**

Supervisor(s): **Assistant Professor Catherine McDermott, Professor Russ Chess-Williams**

Background

Cancer of the prostate most often involves the epithelial component of the tissue, the activity of which is regulated predominantly by the autonomic nervous system involving muscarinic receptors. There is evidence from other tissues that abnormalities in this receptor system may result in altered tissue growth and apoptosis (programmed cell death). There are 5 subtypes of muscarinic receptor and their involvement in the development of prostatic cancer is unknown. The presence of M3 receptors in human prostate has been demonstrated and their expression (protein and mRNA) is increased in prostate cancer. However the functional significance of these receptor changes has not been investigated and the influence of the other receptor subtypes is also unknown.

Aims - To identify the muscarinic receptor subtypes present in human prostatic epithelium, investigate their role in regulating growth and examine possible changes in cancer.

Significance – These studies will enhance our understanding of the cellular mechanisms regulating prostatic epithelial cell growth and by identifying the receptor mechanisms involved, possibly lead to the development of new treatments for prostate cancer.

Methods

- Tissue culture of human prostatic cancer (PC3 and LNCap) and non-cancer (PNT2) epithelial cell lines.
- Radioligand binding assays with [3H]QNB to determine receptor densities for each receptor subtype.
- Assays of cell proliferation (resazurin reduction kit) and apoptosis (caspase 3 kit).

Outcomes - Identification of the muscarinic receptor subtypes, their relative densities and functions in prostatic cancer and non-cancer epithelium, presentation of data at ASCEPT and ICS meetings, publication of at least one full paper.

Project Title: **Toxicity of the bacterial virulence factors in human prostate epithelial cell lines**

Supervisor(s): **Assistant Professor Catherine McDermott, Professor Russ Chess-Williams**

Background

Bacterial prostatitis is a common urological complaint in men under the age of 50 years. *Pseudomonas aeruginosa* is responsible for only 3% of bacterial prostatitis but has proven to be very difficult to treat and results in significant damage to the prostate. There is currently an incomplete understanding of the pathogenesis of bacterial prostatitis which has hindered development of effective treatment strategies. As a result, many of these infections are recurrent. The ability of bacteria to invade the urogenital tract has been linked to their ability to produce an array of cell associated and secretory virulence factors, however little is known of their effects on the prostate**.** Lipopolysaccharide (LPS) is a cell associated virulence factor common to gram negative bacteria such as *P. aeruginosa* and *E. coli* (a common cause of bacterial prostatitis). Pyocyanin is a blue redox-active pigment secreted by *P. aeruginosa* and is known to play an important role in the progression of pseudomonal infections at other sites. However the toxicity of these virulence factors in the prostate has not been investigated.

Aims - The aim of this study is to assess the toxicity of the pseudomonal virulence factors pyocyanin and LPS in human prostate epithelial cell lines in terms of changes in normal function, cell viability, ROS formation and development of oxidative stress. We will also determine if ROS formation plays a causal role in development of toxicity.

Significance – The findings will help our understanding of the effect of bacterial virulence factors on the prostate.

Methods

- Tissue culture of human prostatic epithelial cell lines (LNCaP and PNT2).
- Treatment of cell lines with a range of concentrations pyocyanin alone and in the presence of anti-oxidants
- Assay of cell proliferation (resazurin reduction assay), apoptosis (caspase 3 activity kit), and ROS formation (DCFH-DA fluorescence) – as markers of toxicity.
- Assay of PSA secretion to determine effects on normal prostate function

Outcomes - A greater understanding of the role of these factors in the pathogenesis of bacterial prostatitis could ultimately lead to better or novel therapies. Presentation of data at ASCEPT and ICS meetings, and publication of at least one full paper.

Project Title: The role of ICER and CREB in fatigue related illnesses – Chronic Fatigue Syndrome

Supervisor(s): Associate Professor Sonya Marshall–Gradisnik, Associate Professor Kevin Ashton

Background

cAMP is regulated by the cyclic nucleotide response element modulator (CREM) family including the (CREB) and Inducible cAMP early repressor (ICER), a natural antagonist to cyclic nucleotide response element binding protein (CREB), has a fundamental role in cAMP-associated neuronal plasticity. While intended to function as a modifier of the 'signal to noise ratio' of cAMP, ICER may suppress weak signals thus exacerbating poor cAMP function and may be associated with fatigue related illnesses.

Aims - This projects aims to examine CREB and ICER expression in fatigue related illness, such as Chronic Fatigue Syndrome and healthy aged matched controls.

Significance –

Methods - 15 CFS and 15 Healthy aged matched controls will be used for this study. Molecular analysis involving RT-qPCR protocols and gel electrophoresis will be used to determine and draw correlations on the expressional changes for these protein expressions.

Outcomes - Provide evidence to support the role of ICER in fatigue related illnesses and further evidence for the pathomechanism of CFS.

Discipline: Sport & Exercise Science

Project Title: The Acute Effects of Whole Body Vibration on Glycemia and Shear-Dependent Nitric Oxide Production

Supervisor(s): Assistant Professor Michael Simmonds, Associate Professor Mike Climstein

Background

T2dm is associated with micro/macrovascular complications. Despite being a cornerstone therapy, exercise training is often difficult due to limiting co-morbidities (e.g., obesity, neuropathy). Whole-body vibration (WBV) has been suggested an alternative therapeutic tool to progressive resistance training and aerobic exercise. The aim of the proposed study is to investigate the effects of WBV on glycaemic control and determinants of microcirculatory blood flow (haemorheology) in individuals with IFG or T2dm.

Aims - The aim of this study is to assess the toxicity of the pseudomonal virulence factors pyocyanin and LPS in human prostate epithelial cell lines in terms of changes in normal function, cell viability, ROS formation and development of oxidative stress. We will also determine if ROS formation plays a causal role in development of toxicity.

Methods

Ten individuals with T2dm will be recruited; a continuous glucose monitoring system will be used to blood glucose fluctuations during WBV and sham exercise. Red blood cell (RBC) aggregation/deformability will be measured and plasma analysed for nitric oxide concentration (via colorimetric assay).

Outcomes - Completion of this study will yield a conference presentation (national or International), publication in a peer reviewed journal, identification of a suitable doctoral candidate to continue with work in this particular area. The results will also act as pilot data to attract external funding.

Project Title: A Comparison of Whole Body Vibration, Treadmill walking and Cycling on Glycaemia and Shear-Dependent Nitric Oxide Production

Supervisor(s): Assistant Professor Michael Simmonds, Associate Professor Mike Climstein

Background

The incidence of T2dm has more than doubled in the past 20yrs, and is associated with micro/macrovascular complications and significantly accelerated atherosclerotic related disorders (CVD, CVA, PVD). Exercise therapy is highly challenging in the diabetic cohort due to co-morbidities (e.g., obesity, neuropathy); however, walking remains the most cost efficient non-pharmacological therapy. Whole-body vibration (WBV) therapy may be an effective alternative to conventional treadmill walking and cycling exercise.

Aims - The aim of the proposed study is to investigate the effects of WBV versus low-intensity walking on glycaemic control and in individuals with IFG or T2dm.

Methods

10 Individuals with documented IFG or T2dm will be recruited, a continuous glucose monitoring system will be used to measure blood glucose fluctuations during WBV, walking and cycling exercise.

Outcomes - The successful completion of this study will yield one conference presentation (national), one publication in a peer-reviewed journal, and identification of a suitable doctoral candidate to continue with work in this particular area. The results of this study will also act as pilot data to attract external funding.

Project Title: The influence of beetroot juice supplementation on blood rheology during anaerobic exercise

Supervisor(s): Assistant Professor Michael Simmonds, Associate Professor Sonya Marshall-Gradisink

Background

Acute supplementation of beetroot juice has been reported to improve cycling time-trial performance (Lansley et al., 2011), reduce the oxygen cost of walking (Lansley et al., 2010), reduce blood pressure and is cardio-protective (Gilchrist et al., 2010, Webb et al., 2008). Dietary nitrate is suggested to mediate these changes, given nitrate may be reduced to nitric oxide (Lansley et al., 2010). Given that nitric oxide is a potent vasodilator, the influence of dietary nitrate intake (beetroot juice) on the key determinants of microcirculatory blood flow – blood rheology – is significant in both athletic and chronic disease populations.

Methods

Twelve male subjects (18-45 yr) will perform two supramaximal exercise bouts in a double-blinded manner: once after consuming natural beetroot juice for seven days and once following ingestion of nitrate-depleted beetroot juice for seven days. The pulmonary gas-exchange, haemodynamic, and blood rheology responses to supramaximal exercise will be determined.

Outcomes - Completion of this study will yield a conference presentation (national/international); publication in a high-impact peer-reviewed journal; this area is 'rich' for further research, and suitable candidates will have avenues to develop further in doctoral studies.

Project Title: Influence of nitrate supplementation and nitric-oxide synthase allelic polymorphisms on severe-intensity exercise

Supervisor(s): Assistant Professor Michael Simmonds, Assistant Professor Lotti Tajouri

Background

Exercise performed within the severe-intensity domain induces a delayed steady-state (slow component) in oxygen uptake (VO_2sc), when compared with moderate-intensity exercise. Acute supplementation of beetroot juice improved cycling time-trial performance (Lansley et al., 2011) and reduced the oxygen cost of severe-intensity exercise (Bailey et al., 2009). The improved exercise-efficiency (decreased oxygen cost) of severe-intensity cycling following beetroot juice ingestion was suggested to be mediated by dietary nitrate, which may be reduced to increase nitric oxide (NO) bioavailability (Lansley et al., 2010). Given NO is synthesised by a family of related enzymes (NO synthase; NOS), each encoded by different genes, the aim of the proposed study is to investigate whether exercise performance may be related to variations in NOS.

Aims - Given NO is synthesised by a family of related enzymes (NO synthase; NOS), each encoded by different genes, the aim of the proposed study is to investigate whether exercise performance may be related to variations in NOS.

Methods

Twelve male subjects (18-45 yr) will perform two severe-intensity exercise bouts after consuming natural beetroot juice or nitrate-depleted beetroot juice for seven days in a double-blinded, crossover method. The pulmonary gas-exchange, haemodynamic, and plasma NO response to severe-intensity exercise will be measured. Plasma NO will be determined via colorimetric assay from whole blood collected during exercise. In our study of inducible, neuronal, endothelial and erythrocytic NOS genes, PCR based assays will be developed to amplify a region of promoter regions and coding regions genes containing known microsatellite variations. Supporting physiological data suggests that NO production is responsible for better performance in exercise, which may be due to the blue print regulation of NOS activity. Specific amplified products can be identified by fluorescent capillary electrophoresis and restriction fragment length polymorphism with allele frequencies determined statistically compared using chi-squared analysis.

Outcomes - Completion of this study will yield a conference presentation (national/international); publication in a high-impact peer-reviewed journal; the positive effect of nitrate supplementation may be associated with the blueprint polymorphisms for NO biosynthesis; further studies may provide the candidate with avenues for doctoral research.

Project Title: **Prevalence of Sarcopenia among older adults using aged care**

Supervisor(s): **Associate Professor Justin Keogh, Dr Tim Henwood (UQ)**

Background

Sarcopenia is a problem facing all older adults. However, till recently, this later life syndrome has been poorly defined, leaving it hard to accurately investigate. The European Working Group on Sarcopenia (EWGS) has identified it as a progressive and generalised loss in muscle mass and strength with a risk of adverse physical outcomes in later life. While previous analysis has returned mixed results, with a clear definition an assessment criteria has also been established allowing for accurate identification of the prevalence among the old and very old.

Aims - The project aims to identify prevalence of sarcopenia among older Australian using aged care.

Methods

Bioelectrical impendence analysis, grip strength and walking speed data will be collected from a cohort of low and high care older adults accessing or residing with an aged care provider. Data will be analysed against the EWGS definition to identify sarcopenic prevalence in the cohort.

Outcomes - It is hypothesised older adults with higher care needs will display greater prevalence of sarcopenia.

Project Title: The effect of intense exercise and training on immune function in competitive athletes

Supervisor(s): Associate Professor Bon Gray, Associate Professor Sonya Marhsall-Gradisnik

Background

Periods of intense athletic training and competition are associated with an increased risk of infection, particularly of the upper respiratory tract (Nieman, 2007). The immunological and physiological processes underlying these changes are poorly defined (Malm, 2004). Research in this area has been hampered by a lack of concordance between the training programs undertaken by athletes (eg: High-intensity exercise, undertaken in multiple sessions per day, 6-7 days/week) and the protocols employed by researchers (eg: 30-60 minutes of moderate aerobic exercise).

Aims - This study seeks to address this disparity by investigating athletes (elite swimmers) involved in their usual training program.

Methods

Blood samples will be collected at multiple time-points, across training sessions, training days, and training weeks, to allow assessment of selected immunological parameters (eg: Leucocyte concentrations, granulocyte and lymphocyte activity). Subjects will also complete a daily training diary to record instances of illness and/or injury. Age- and sex-matched control groups will also be employed to account for diurnal and seasonal variations in immune function.

Outcomes - It is intended that the study will begin to identify potential “markers” of immunological status that can be routinely applied to monitoring the training of elite athletes.

Project Title: An analysis of upper body and lower body rate of force development (RFD) and power characteristics in professional Rugby League players

Supervisor(s): Assistant Professor Chris McLellan, Associate Professor Bon Gray

Background

Participation in contact sport such as Rugby League involves high-intensity, intermittent exercise that requires repeated bouts of force and power development. Despite the existence of an elite National Rugby League (NRL) competition in Australia there is limited published data available on the upper body (UB) and lower body (LB) rate of force development (RFD) and peak power (PP) characteristics of professional players. No studies have examined the relationship between measures of peak RFD (PRFD) and PP for the UB and LB in elite Rugby League players over a regular season period in the National Rugby League (NRL).

Aims - The purpose of this paper is to investigate the relation between measures of PRFD and PP in professional rugby league players conditioned to high levels of force development, speed, and power. Furthermore, the interrelation between various tests of PRFD and PP will be investigated.

Methods

Participants in the present study will include elite male Rugby League players aged 18-32yrs. Participants will take part in weekly vertical jump (VJ), sprint (10m & 40m), bench throw (BT) and three repetition maximum (3RM) strength tests for the upper (UB) and lower limbs (LB) during a 26 week regular-season period in the 2012 NRL. Anthropometric and skin fold measures will also be taken at week 6 intervals

Outcomes - The results of the present study will present original applied research in the sport of Rugby League and will be of benefit to researchers and coaches attempting to understand the relation between force and power of the UB and LB in elite Rugby League players.

Project Title: A comparison of National Rugby League (NRL) and Super 15 Rugby match-play characteristics using Global Positioning System (GPS) and portable accelerometer technology

Supervisor(s): Dr Chris McLellan, Dr Bon Gray

Background

Rugby League and Rugby Union are collision sports that involve frequent bouts of high-intensity exercise (sprinting, tackling, and running) separated by bouts of low-intensity exercise (walking and standing). Global Positioning System (GPS) technology has been used to examine player movement characteristics to determine position specific running profiles during elite Rugby League and Rugby Union match-play. Although match-play analysis has been undertaken in elite Rugby League and Rugby Union independently, no studies have examined match-play comparisons of National Rugby League (NRL) and Super 15 Rugby match-play.

Aims - The aim of the present study is to i) to examine the physiological demands of professional Rugby League and Rugby Union match-play using portable Global Positioning Systems (GPS) to monitor player's movement patterns and ii) examine positional comparisons of each sport to determine if a player's physiological requirements are influenced by their playing position during match-play.

Methods - Participants in the present study will include elite male Rugby League and Rugby Union players aged 18-32yrs. Participants will be monitored during weekly regular season match-play in the NRL and Super 15 in 2012.

Outcomes - The results of the present study will present original applied research in the sports of Rugby League and Rugby Union and will be of benefit to researchers and coaches attempting to understand the utilisation of portable GPS to provide a more detailed and specific analysis of player movement patterns in professional Rugby League and Rugby Union match-play.

Discipline: Medicine

Project Title: Utilising nanofibrous scaffold and stem cells in design of a skin substitute

Supervisor(s): Professor Patrick Warnke, Dr Sebastien Stephens

Background

Skin defects due to skin cancer resection, burns or other trauma need immediate replacement by autologous tissue grafts to avoid significant scarring or subsequent infection. Where large defects cannot be repaired due to limited skin donor sites, the development of artificial skin replacements could offer a potential to cover the defect.

Currently available skin substitutes regularly experience a variety of complications, including scarring at the graft margins, complete lack of functionality and poor integration. The aim of the study is to fabricate a skin substitute such that post-implantation, the complete structural and partial functional properties of the wounded area are restored to the level before injury.

Aims – To fabricate novel nanofibrous scaffolds and evaluate their ability to preserve the functionality of skin cells; Surface-modify the scaffolds using growth factor and contact guidance molecules to optimise cellular interactions and provide mechanical support that mimics the natural extra-cellular matrix (ECM) for enhanced cellular growth and differentiation.

Significance – The novelty of this proposal rests in the design of nanofibrous scaffolds that are capable of providing biophysical and biochemical signals in controlled manner to program the complex skin regeneration process.

Methods - We are planning to design unique artificial skin patches made from polymer nanofibres. These artificial skin patches could even be loaded with bio-functional signalling molecules and growth factors to manipulate and enhance the patient's own cell adhesion, growth and differentiation. Furthermore, the biomechanical properties of the scaffolds will be designed to match natural skin and investigated for optimal tissue growth.

Outcomes - The expected future outcomes of such novel technologies are novel therapy concepts that move closer towards successful treatment of large skin defects. The goal of this pilot HONS project are to move towards to the first step to develop nanoscale fibrous materials capable to act as a skin replacement and to host skin cells. This would have the potential to create a follow up PhD project then with the focus to mimic the entire human skin architecture.

Project Title: **Utilising nanofibrous scaffold and neural stem cells in treatment of spinal cord injuries**

Supervisor(s): **Professor Patrick Warnke, Assistant Professor Qin Liu**

Background

Currently there is no effective treatment for spinal cord injuries (SCIs) and the physical and psychological consequences to the patient and their families are devastating. This project will utilise the unique properties of polymer nanofibres to guide the proliferation and differentiation of neural stem cells (NSCs) into functional nerve tissue. The expected future outcomes of such technologies are novel therapy concepts that move closer towards successful treatment for SCIs.

Aims – Manufacture novel nanofibrous scaffolds and evaluate their capacity to maintain NSCs and control their differentiation into neural support cells; Surface-modify our scaffold to provide signalling cues to direct axon growth.

Significance – The novelty of this proposal lies in the design and manufacture of nanofibrous scaffolds to provide biophysical and biochemical cues to specific microenvironments in order to overcome the complex events that inhibit repair following SCIs.

Outcomes - The goal of this HONS project are to move towards to the first step to develop nanoscale fibrous materials capable to host nerve cells and guide their growth. This would have the potential to create a follow up PhD project.