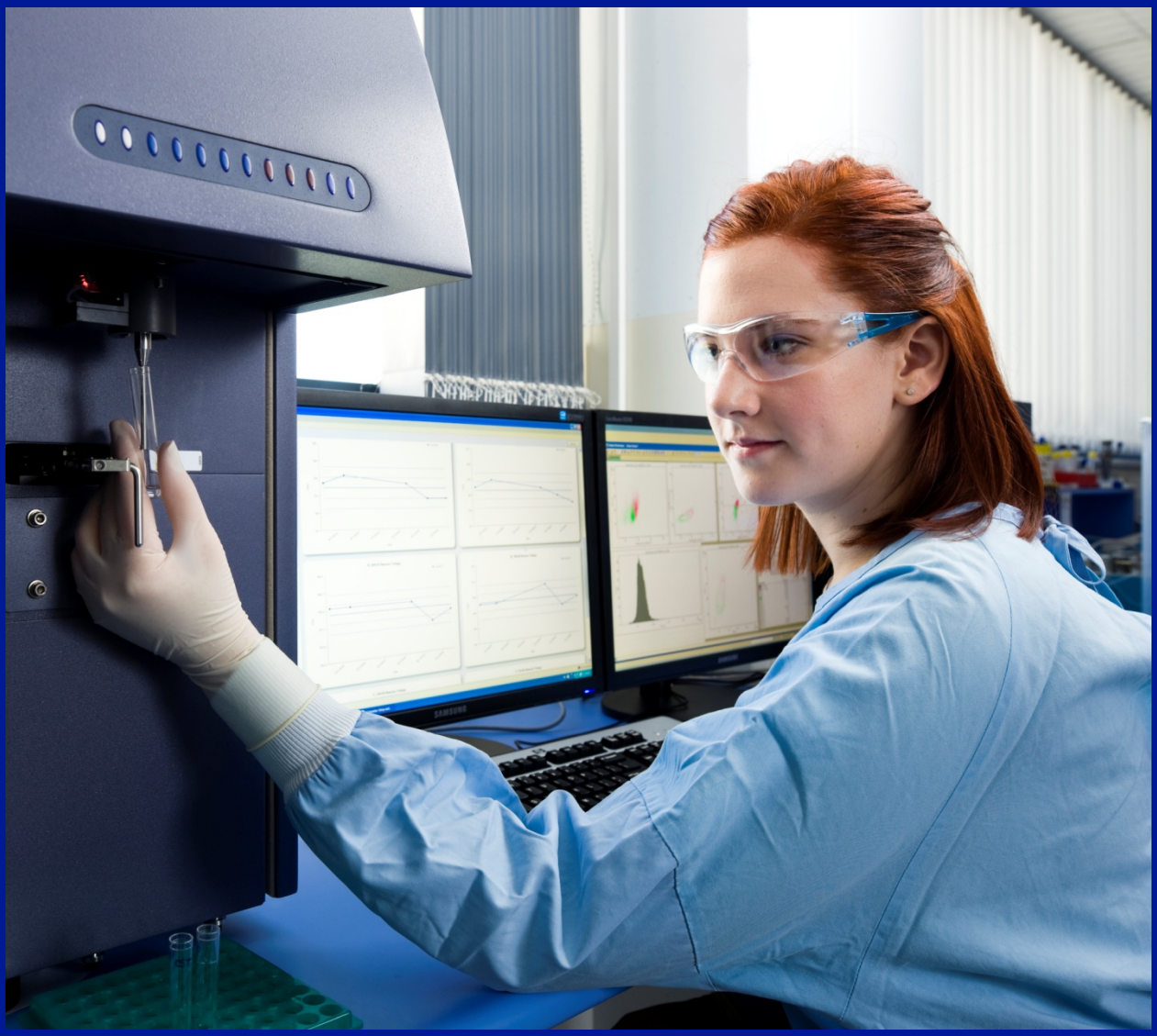
UniSA

2012 Honours Research Book
School of Pharmacy and Medical Sciences



Bachelor of Medical and Pharmaceutical Sciences (Honours)

Why the Bachelor of Medical and Pharmaceutical Sciences (Honours)?

Thank you for your interest in undertaking the Bachelor of Medical and Pharmaceutical Sciences (Honours) within the School of Pharmacy and Medical Sciences of UniSA.

Undertaking an Honours program with the School of Pharmacy and Medical Sciences will allow you the chance to work one-on-one with a research-active academic or within a research group and to participate in the research culture of the School. It will also provide you with the opportunity to contribute to the development of knowledge in your area.

The program is designed around project based, hypothesis-driven research. As an Honours student you will enjoy access to our **state of the art facilities**, and to a wealth of knowledge from our research-active academic staff.

The School has established an international reputation for high quality research aimed at improving human health outcomes. Our academic staff, honours students, and postgraduate students contribute to a great variety of scientific study, aimed at helping to find solutions to the major health challenges facing our planet. From cancer treatment to infectious diseases, nutrition to health policy and education, DNA and gene technology to complementary therapies, our researchers' interests are many and varied, but they all share a spirit of cooperation and a desire to improve human health outcomes through innovative research.

In this document you will find a description of potential Honours supervisors within our School, their respective research groups, projects and contact information.

If you would like to know more about the program, your options and the support available to you, please do not hesitate to contact us.

Program Officer:
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Quality Use of Medicines and Pharmacy Research Centre

This research Centre has earned a national and international reputation for its work in evaluating medicines policies, implementing the principles of national medicines policies into the health service delivery and the development of training and educational programs. The Centre focuses on the development, implementation and evaluation of national medicines policies through research, consultancy and training in community, hospital, institutional, professional and government settings.

Dr Gillian Caughey (Post-doctoral Research Fellow)

http://people.unisa.edu.au/Gillian.Caughey

Dr Caughey's current research focuses on a NHMRC/ARC Ageing Well, Ageing Productively (AWAP) project grant entitled: "The development and evaluation of management strategies designed to address poly-morbidity in older people: Implications for health policy planning, practitioners and patients". This study aims to identify, develop and evaluate management strategies for older people with multiple chronic conditions, of which arthritis; in particular osteoarthritis is a key condition in these studies.

Dr Caughey also works on developing Australian clinical indicators for potentially preventable hospitalisations. In Australia, over 90,000 hospitalisations per year are considered potentially preventable, and are estimated to cost the healthcare system $330 million annually. With administrative health databases, it is now possible to identify and routinely monitor clinical indicators of potentially preventable hospitalisations. Clinical indicators have been developed internationally; however, none have been developed specifically for the Australian setting. The aim of this study is to develop and validate Australian clinical indicators of potentially preventable medication-related and primary care-related hospitalisations. The prevalence of hospitalisations based on these indicators will be examined in a population-based administrative health database. The potential to identify patterns of preventable hospitalisation through existing data sets has great possibilities for avoiding adverse events, improving health outcomes and improving standards of care.

Dr Caughey is also the postgraduate student contact with the QUMPRC.

Dr Svetla Gadzhanova (Post-doctoral Research Fellow)

http://people.unisa.edu.au/Svetla.Gadzhanova

Dr Gadzhanova is undertaking a joint project between the QUMPRC and National Prescribing Service (NPS) to evaluate NPS initiatives. Her research interests include:

- Pharmacoepidemiology and the quality use of medicines
- Data mining (special focus on temporal data abstraction) of data from electronic health records
- Evaluation of change management behaviour in Primary Health Care.

Dr Geoff March (Lecturer, Pharmacy Practice)

http://people.unisa.edu.au/Geoff.March

Dr March undertakes research and consulting work in various aspects of QUMPRC, primarily in the area of practice research.

Dr Nicole Pratt (Senior Research Fellow)
http://people.unisa.edu.au/Nicole.Pratt
Dr Pratt is an experienced statistician with a particular interest in pharmacoepidemiology and new statistical methodologies to study the effectiveness and safety of medicine use.

Dr Kym Preiss (Post-doctoral Research Fellow)
http://people.unisa.edu.au/Kym.Preiss
Dr Preiss has a particular interest in the use of linked databases to examine health issues. He is currently involved in an NHMRC/ARC Ageing Well, Ageing Productively project (see Dr Gillian Caughey).

Dr Deepa Rao (Lecturer, Pharmacotherapeutics)
http://people.unisa.edu.au/Deepa.Rao

Associate Professor Libby Roughead
http://people.unisa.edu.au/Libby.Roughead
Associate Professor Roughead's research interests include public policy concerning medicines, improving use of medicines and studies of the patterns of medication use and adverse drug events. She is currently co-director of a national program that aims to improve use of medicines by Australian veterans. She is also chief investigator on NHMRC grants assessing the impact of consumer co-payments on medicine use and medication management in the elderly.

Dr Susan Semple (Research Fellow)
http://people.unisa.edu.au/Susan.Semple
Dr Semple has a research interest in Australian medicinal plants. Currently she is involved in collaborative research projects with indigenous communities examining the pharmacological activities of some traditional medicinal plants. This includes an ARC Linkage project with Chuulangun Aboriginal Corporation. Further research interests include Antimicrobial activity of Australian Aboriginal medicinal plants, collaborative research with Aboriginal communities, isolation and structural determination of biologically active compounds from plants, complementary medicine use in the community, Information needs of consumers of complementary and alternative medicines and medication safety.

Dr Agnes Vitry (Senior Research Fellow)
http://people.unisa.edu.au/Agnes.Vitry
Dr Vitry has a research interest in the quality use of medicines including pharmacoepidemological studies, quality of information for health professionals and consumers, quality of drug promotion and impact on medicines use, medicines policy and regulation. She is the project leader of the Ageing Well, Ageing Productively (AWAP) five year research project.

Dr Chris Alderman (Associate Professor)
http://people.unisa.edu.au/Chris.Alderman
Dr Alderman is Associate Professor Pharmacy Practice within the School of Pharmacy and Medical Sciences and Director of Pharmacy, Repatriation General Hospital, Daw Park South Australia. He has a range of research interests in connection to the Quality Use of Medicines, particularly as this relates to safety and quality of drug treatment, the development of new services or treatment approaches, understanding of adverse effects of drugs, pharmacoepidemology, hospital pharmacy and clinical pharmacy services.

Associate Professor Chris Alderman has previously supervised a number of honours year and master's degree candidates in projects addressing areas including VTW thromboprophylaxis,

psychotropic drug utilisation reviews, drug usage in renal impairment, management of AF, glycaemic control in diabetes, drug-related falls and tranquiliser usage and dependence. He offers opportunities for students to undertake Honours projects based in a hospital pharmacy department.

More information on QUMPRC:

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Therapeutics and Pharmaceutical Science Research Group

The TPSRG is an active research unit seeking to improve patient outcomes and quality of life through the appropriate and timely clinical implementation of therapeutics derived from pharmaceutical sciences and medicine. The Group's research interests cover a spectrum of therapeutics from the chemistry of drugs (including modelling, drug design and natural products), the effects drugs have on the body (pharmacology and toxicology) and the effects the body has on drugs (pharmacokinetics and drug delivery), through to how drugs can be best used to treat diseases (topical drug delivery and the quality use of medicine) for patients.

Associate Professor Bob Milne

http://people.unisa.edu.au/Robert.Milne

Assoc Prof Bob Milne is currently working on a project involving clopidogrel. Clopidogrel is an anti-platelet agent being used increasingly in babies who have had open heart surgery. They are usually commenced on doses of 0.2 mg/kg/day. Currently, doses ranging from 0.6 mg to 2 mg are prepared in capsules with an expiry of three months. The capsules are made in response to prescriptions for individual patients. It would be preferable to have an oral liquid dose formulation available that would allow for a longer storage and for more flexible dosing of children.

Work has already commenced on the project, and preliminary results suggest that a liquid dose form is unlikely to be stable for a suitable period of time. However, this is only preliminary work using a high-performance liquid-chromatography method that resolves clopidogrel from two of its degradation products, and the chromatographic analysis does require improvement. In continuing this project to its resolution (i.e. is it suitably stable or is it not?), the following issues will need to be resolved:

1. Refining the HPLC method for analysing clopidogrel; and resolving it from degradation products and other chromatographic interferences
2. Examining the chemical stability of clopidogrel in aqueous/non-aqueous mixes across a range of values of pH
3. Devising a suitable formulation for children
4. Confirming the chemical stability of the formulation
5. Determining the microbiological stability of the final formulation

Dr Kristen Bremmell (Senior Lecturer, Pharmaceutical Science)

http://people.unisa.edu.au/Kristen.Bremmell

Dr Bremmell undertakes research in the areas of formulation science, drug delivery and bio-pharmaceutical purification. General interests include protein aggregation and adsorption on surfaces which is important in areas such as biomaterials design and pharmaceutical delivery, novel, controlled release formulations of drugs and ultra-deformable liposomes for application in dermal delivery.

Current projects:

1) *Biopharmaceutic protein formulation: Controlling aggregation and adsorption*
   (Project collaborators: Clive Prestidge and Benjamin Thierry (Ian Wark Research Institute), Tim Barnes and Kristen Bremmell)
   How does formulation of biopharmaceuticals control their aggregation and adsorption? Biopharmaceuticals are an important class of therapeutic drugs. Their structure is highly sensitive to the local environment, where denaturing, aggregation and adsorption to container walls may occur. As even minor structural changes can alter protein functionality, biopharmaceutical product formulation is critical to maintain the native protein structure and functionality. The impact of different aspects of solution formulation on protein aggregation behaviour and their interaction with surfaces will be studied in this project for application in bio-pharmaceutical purification and their use in drug delivery. A range of experimental techniques, including; Quartz crystal microbalance, isothermal calorimetry, atomic force microscopy, circular dichroism, dynamic light scattering and zeta potential will be used.

2) *Controlled release using stimulus responsive polymer layers*
   (Project collaborators: David Beattie (Ian Wark Research Institute) and Kristen Bremmell)
   The storage and release of small therapeutic molecules from surfaces and colloidal systems is a key goal of many drug delivery studies. Polymer multilayer films represent a very attractive class of surface treatments that can be used for this purpose, in for example, implants and dermal patches. Such films can be made to be biocompatible, non-fouling, and lubricious. In addition, these layers can be produced in such a way as to make them stimulus responsive, i.e. their composition and properties can be altered by 'flicking a switch' in the system, such as changing temperature, pH, or exposure to UV light. The aim of this project is to use such films to selectively absorb and release model therapeutic agents in response to such stimuli.

Dr Tim Barnes (Lecturer, Pharmaceutics/Pharmaceutical Science)

http://people.unisa.edu.au/Tim.Barnes

Dr Barnes' research is focused on the development of novel drug delivery systems for the delivery of peptide/protein therapeutics and poorly soluble drugs, such as: emulsions, liposomes, mesoporous materials (e.g. porous silicon), dendrimers and nanoparticles. This work involves laboratory work to prepare the formulations which are then characterised using a range of advanced physicochemical techniques, including the Australian Synchrotron. In collaboration with other internal and external (e.g. hospital) researchers we also test the optimised formulation using animal models.

Dr Matt Sykes

http://people.unisa.edu.au/Matt.Sykes

Dr Sykes has a number of projects available which are broadly in the area of molecular modelling. Whilst the projects are broadly computational, there is the ability to incorporate some synthetic chemistry/pharmacology if you would prefer a combined project. The exact composition of these projects is open to negotiation, as I am keen to include aspects which are most appealing to potential honours students. Current projects are:

1) *Determination of the important molecular factors involved in PP2A activation – an important enzyme in tumourigenesis*
(Associate Supervisors: Dr. Nikki Verrils, Uni. Newcastle; Prof Ross McKinnon, UniSA)

   PP2A plays a central role in the regulation of cell growth, survival and differentiation, and its functional inactivation or down-regulation has been demonstrated in a variety of human malignancies. Inhibition of PP2A permits the activation of oncogenic pathways which promote disease progression by enhancing cellular proliferation and survival, impairing differentiation and increasing the genomic instability of the transformed cell. Therefore rescuing PP2A tumour suppressive activity is an attractive therapeutic strategy for these cancers.

   The group of Nikki Verrills at the University of Newcastle have shown that pharmacological activation of PP2A by the sphingosine analogue, FTY720, inhibits leukaemogenesis driven by BCR/ABL or mutant c-KIT , in vitro and in vivo. This project will set out to determine the important molecular features relevant to the activation of PP2A by using molecular modelling approaches using the data available both from the literature and from Newcastle. Once the important molecular factors have been determined, virtual screening approaches will be used to either design new inhibitors and/or attempt to predict other existing molecules that are able to modulate PP2A activity.

2) *Virtual screening: investigation of multiple shape-matching*
   Molecular shape is a crucial part of the molecular recognition process when a ligand binds to a target protein. Shape matching is a crucial part of the virtual screening (i.e. using a computer) process used to identify new potent inhibitors using existing data. Studies performed in my lab have shown that the shape matching process works well in early-stage screening, but its performance declines as the screening process proceeds. This project will seek to examine the utility of multiple-shape querys as a way of improving outcomes from virtual screening projects, which are of vital importance in the global pharmaceutical industry. For example, AstraZeneca have recently advertised for 11 positions in this field.

3) *Pharmacological investigation of UGTs: structure-activity relationships*
(Associate Supervisor: Prof John Miners, Flinders University)

   I have a longstanding collaboration with Professor John Miners at Flinders University. My projects with John have tended to be in the area of what might be termed structure-activity relationships. UGT's are an important family of drug metabolizing enzymes, with a large number of new therapeutics coming onto the market being eliminated via this route.

These projects could either be purely computational or a combination of molecular modelling/pharmacology lab work. For example, recently we have been looking at understanding the pharmacology of a series of HIV integrase inhibitors and connecting this to the molecular structures of these compounds. Students interested in working in this space could negotiate a tailored project in this area with us.

Dr May Song
http://people.unisa.edu.au/May.Song
Dr Song has broad research interests in the development of pharmaceutical preparations:

- Novel drug delivery system development
- Formulation improvement & development
- Quality evaluation
- In-vitro & in vivo studies
- Analytical services
- Applications of the above in the pharmaceutical industry

Currently, Dr Song is offering a project for an Honours student. The study will investigate a non-invasive method to detect and monitor small intestinal function and the severity of mucosal damage. An oral capsule for controlled-release of ^{13}C labelled sodium acetate will be prepared using modern pilot scale equipment. When administered to the rat and on reaching the small intestine, $^{13}CO_2$ will be released and collected. Measuring the $^{13}CO_2$ release profile in the expired breath is an indicator of injury and dysfunction in the small intestine. The results will demonstrate that this approach can be used for the study of chemotherapy-induced mucositis and pave the way for clinical trials of the technique to evaluate procedures for control or prevention of chemotherapy induced mucositis.

Dr David Foster (Lecturer in Pharmacokinetics) http://people.unisa.edu.au/David.Foster
Dr Richard Upton (Professor of Pharmacometrics) http://people.unisa.edu.au/Richard.Upton

Our research is primarily focused on identifying the pharmacokinetic and pharmacodynamic factors which govern variability in drug response. This work employs pharmacometric analysis (modelling and simulation) as a tool to translate basic and clinical research into improved pharmacotherapeutic use. Pharmacometrics is the science which deals with the quantitative description of disease, drug effects and variability. This field quantifies drug, disease and trial information to aid efficient drug use, development, and regulatory decisions. The strength of such analyses is the ability to integrate knowledge from prior understanding, related compounds and biology, together with the ability to include both richly sampled data and more limited/incomplete data typically unusable in traditional statistical approaches. This area has traditionally been poorly understood by mainstream biomedical researchers. However, this is now changing and increasingly researchers, regulatory authorities and funding bodies are recognising the power and utility of pharmacometric analyses.

Professor Michael Roberts (Professor of Therapeutics and Pharmaceuitcal Science)
http://people.unisa.edu.au/Michael.Roberts

Professor Roberts is a NHMRC Senior Principal Research Fellow and is internationally recognised for his work in pharmaceutical product development and evaluation, nanotechnology, clinical toxicology, quality use of medicine and clinical pharmacokinetics in critical care, hepatology and geriatrics. A long standing passion has beenunderstanding drug - delivery system - skin interactions. Research arising from this interest underpins includes optimal drug delivery

strategies for skin diseases, potential toxicity of nanotechnology, nanopatches for vaccine delivery, enhanced peptide delivery through skin, safe and effective use of topical products and the use of flexible nanosomes for siRNA delivery.

More information on TPSRG:

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Mechanisms in Cell Biology and Disease Research Group

This research group is focused on cell biology of endosomes and lysosomes. These intracellular organelles form a direct interface between the cell and its environment, and have functions in endocytic uptake, intracellular signalling, immune reactivity, secretion and macromolecular degradation. We are studying the molecular machinery for this essential network of organelles and are developing specific probes that visualise their function. Endosome and lysosome dysfunction is involved in major diseases that include: lysosomal storage disorders, infection/inflammation, cancer and heart disease. By researching the pathophysiology of these diseases we are identifying new diagnostic and prognostic markers, and potential points for therapeutic intervention.

Specific projects for students commencing in 2010/11 include:

- Altered lysosomal biogenesis in breast cancer;
- Non-invasive breath testing to detect inflammation and gastrointestinal disease;
- Altered lysosomal function and pathogenesis in lysosomal storage disorders;
- The development of vectors for gene delivery and the treatment of neurological disorders;
- The development of molecular probes to visualise endocytic function.

Professor Doug Brooks (Group Leader)

http://people.unisa.edu.au/Doug.Brooks

Professor Brooks has over 25 years of experience in medical research and is an NHMRC funded Senior Research Fellow and Research Professor in Molecular Medicine. For 24 years he worked in the Lysosomal Diseases Research Unit (LDRU) at the Women's and Children's Hospital, on a group of genetic diseases called lysosomal storage disorders. The LDRU has been responsible for significant health outcomes for this group of disorders, with the development of strategies for early screening, diagnosis and treatment. This research reflects his strong interest in lysosomal cell biology and a desire to develop practical applications in biochemical medicine that benefit patients and the wider community.

Dr Sally Plush (Research Fellow and Lecturer, Chemistry)

http://people.unisa.edu.au/Sally.Plush

Luminescent sensors for lysosomal activity (collaboration with Doug Brooks)

The progression of a number of diseases is linked to the development and function of lysosomes. The ability to monitor the development of lysosomes would significantly aid current research efforts into such diseases. The project combines the use of luminescent pH sensors coupled with enzyme sensitive groups to monitor the development of lysosomes in vivo.

Designing new combination therapies for malaria (collaboration with Ellen Nisbet)

There is a great need for new anti-malarial drug as the resistance to many of the current anti-malaria drugs is rapidly increasing. Recently a new class of chemical compounds has been

discovered that show anti-malarial activity. This project aims to synthesise new compounds with combinational anti-malarial activity which can report on the localisation of activity.

Self-assembled nanoparticles for magnetic resonance imaging
In recent years, we have witnessed a rapid growth in applications of nano-materials for drug delivery and molecular imaging. Nanoparticles offer a unique platform within which to combine diagnostic imaging capabilities with therapeutic agents. The aim of the project is to develop organic monomers that can potentially self assemble to form micelles on the addition of a lanthanide ion.

Dr Tetyana Shandala
http://people.unisa.edu.au/Tetyana.Shandala
To understand secretion as a mean of controlling innate immunity
The aim of this research project is to understand the genetic control of innate immunity. Innate immunity is a highly conserved mechanism that eukaryotic organisms use to protect themselves against environmental challenges. Inappropriate function of innate immunity has been implicated in various high profile diseases including cancer, asthma, and arteriosclerosis. Therefore, a clear understanding of the molecular mechanisms involved in generating an innate immune response, has great significance.

As a means of communicating immune stress, the cells of the immune system secrete a variety of immune mediators, including the anti-microbial peptides, the cytokines, and chemokines and mediators. However, the intracellular routes of their secretion by different cells are only now emerging. This project will employ the most powerful *in vivo* model system available, *Drosophila melanogaster*, which has already proven to be instrumental in discovering major conserved steps of immune-response pathways. Using a combination of sophisticated molecular, genetic, pharmacological and cell biological approaches, this work will provide a critical understanding of how innate immunity works, as well as to give us potential therapeutic targets.

We aim to identify novel regulators of multiple innate immunity pathways. By uncovering the molecular mechanism of innate immunity, we will identify potential points for therapeutic intervention in major inflammatory diseases.

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Bone Growth and Repair Research Group

An international leader in paediatric bone biology research, the Sansom Institute's Bone Growth and Repair Research Group (BGRRG) explores the mechanisms and regulation of children's bone growth, bone growth defects, growths plate and bone injury and repair. The Group's research is aimed at developing biological treatments that impact on children's bone growth, bone mass accumulation and adult bone health.

Using in vivo, ex vivo and in vitro models and a wide range of histological, cellular and molecular techniques, the Group's research activities can be classified into three areas: (1) the mechanisms of bone growth, bone mass accumulation, and nutritional regulation; (2) growth plate injury responses, repair mechanisms, and growth factor and/or stem cell-based

regeneration; and (3) pathophysiology for and prevention of cancer chemotherapy-induced bone growth defects.

Professor Cory Xian (Group Leader)

http://people.unisa.edu.au/Cory.Xian

Professor Xian is an NHMRC Senior Research Fellow and Professor of Bone Research. He is interested in tissue growth and injury repair research. Current research interests:

- Bone growth mechanisms and regulation including nutritional intervention;
- Mechanisms for injury responses and bone growth defects after growth plate fracture;
- Development of biological treatments (growth factors or stem cell based) for repairing injured growth plate cartilage;
- Mechanisms for chemotherapy-induced bone growth arrest and osteoporosis and development of preventative treatments.

Dr Rosa Chung (Research Fellow)

http://people.unisa.edu.au/Rosa.Chung

Dr Chung is a recent PhD graduate who has been working with the BGRRG from the time of undertaking her Honours study. Her current research interests are focused on bone and growth plate cartilage injury and repair, specifically mechanisms for injury responses and bone growth defects after growth plate fracture and the development of biological treatments (growth factors or stem cell based) for repairing injured growth plate cartilage.

Dr Alice Lee (Research Associate)

http://people.unisa.edu.au/Alice.Lee

Dr Lee has recently completed her PhD. She has studied in the field of bone health with regards to the roles of nutraceuticals such as calcium and vitamin D. Her work with her PhD supervisors has identified the relative importance of calcium and vitamin D on regulating the biochemical, molecular and cellular activities which impact one bone structure and strength.

More information on BGRRG:

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Experimental Therapeutics Laboratory

The Experimental Therapeutics Laboratory is a collaborative group of scientists of the Sansom Institute and Hanson Institute with interests in tolerance and immunity. The lab performs basic, translational and clinical research aimed at developing new therapeutics to prevent and treat diseases such as cancer and acute infections, as well as chronic medical conditions such as pain and addiction.

The group is jointly headed by Dr John Hayball (Senior Lecturer, UniSA) and Professor Michael Brown (Senior Medical Oncologist, Royal Adelaide Hospital), and has a history of productive industry associations. This experience, combined with our clinical expertise and collaborations, ensure that the research we generate has a strong likelihood of clinical translation resulting in real therapeutic outcomes for patients.

Theme title: Tolerance and Immunity Research Field: Immunology

Dr John Hayball (Co-group Leader, Senior Lecturer, UniSA)

http://people.unisa.edu.au/John.Hayball

Dr Hayball has an interest in understanding the fundamental mechanisms involved in controlling the mammalian immune response, particularly those involved in the development of an early innate immune response. He is using this information in rational approaches to develop new therapeutics for the prevention and treatment of diseases such as cancer, infection and wound healing. Dr Hayball supervises a number of Honours and PhD students involved in basic research, as well as research undertaken collaboratively with industry partners and across disciplines.

Prof Michael Brown (Co-group Leader; Director Cancer Clinical Trials Unit, RAH)

http://people.unisa.edu.au/Michael.Brown

Prof Brown originally trained as a clinical and laboratory immunologist and has an ongoing interest in preclinical and clinical cancer immunotherapy. This includes the development and use of cancer vaccines, and adoptive T cell therapy. Adoptive T cell therapy is a new approach in Australia to treating metastatic melanoma, where the patient's own T cells are expanded and modified within the laboratory to recognise melanoma; these anti-melanoma T cells are then reinfused into the patient.

Dr Chris Della Vedova (Lecturer, Biochemistry and Biochemical Sciences)

http://people.unisa.edu.au/Chris.DellaVedova

Dr Della Vedova is interested in the genetic and immunological mechanisms of chronic pain and stress conditions. Specifically, he is exploring the role of inflammatory cytokines and genetic changes that occur in people suffering from these chronic conditions. In collaboration with researchers in the field of human movement, we are seeking to establish whether alternative therapies such as yoga and meditation have the capacity to modify the pathophysiology of these disorders.

Dr Kerrilyn Diener (Postdoctoral Research Fellow)

http://people.unisa.edu.au/Kerrilyn.Diener

Dr Diener's interests lie in understanding the early innate immune mechanisms behind antigen recognition and presentation, particularly those relating to viral infection and pregnancy. Dr Diener's research focus investigates the effect that viral infection within the reproductive tract has on reproductive outcomes, and whether early infection can have long term effects on behaviour in offspring, including the induction of autism after pre-pubescent vaccination.

Dr Cara Fraser (Postdoctoral Research Fellow)

http://people.unisa.edu.au/Cara.Fraser

Dr Fraser's primary research interest is in understanding the mechanisms of action behind individual cancer therapies, and using this information to help in the design of combination therapies to achieve better outcomes for cancer patients. Dr Fraser is particularly interested in studying combination therapies for those patients who have a particularly poor prognosis, such as those diagnosed with metastatic melanoma.

Dr Alex Staudacher (Postdoctoral Research Fellow)

Dr Staudacher's research interests include the use of radioimmunotherapy for the treatment of cancer. By incorporating different energy-emitting radionuclides into an existing experimental targeted cancer therapy, Dr Staudacher is investigating the ability of this modified therapy to target solid tumours and deliver a damaging dose of radiation to cancer cells while reducing

damage to the surrounding normal tissue, and how this can operate in conjunction with chemotherapy regimens.

Dr Erin Lousberg (Postdoctoral Research Fellow)
http://people.unisa.edu.au/Erin.Lousberg
Dr Lousberg is interested in the innate immune system and its role in dictating the outcome of many conditions including the response to vaccination and pain, as well as the effects of neurologically-responsive compounds such as alcohol and opioids. Dr Lousberg is interested specifically in studying the role of the inflammasome, a newly discovered innate immune system 'danger sensor', and determining its role in these conditions.

Current projects within the Experimental Therapeutics Laboratory include:

Inflammation research projects

- Defining the early innate inflammatory mechanisms behind the immune response to fowlpox virus vaccination
- Assessing the neutralising activity of anti-HMGB1 antibodies in serum samples from septic shock patients and in an experimental murine model of bacterial sepsis
- Assessing the neutralising activity of anti-HMGB1 antibodies in vitro and in preclinical models of cancer
- Determining the mode of action of HMGB1 in wound healing
- Understanding how innate inflammation in response to viral infection can affect pregnancy outcomes
- Determining how viral infections during early pregnancy may impact on the induction of autism after pre-pubescent vaccination
- The role of the inflammasome in dictating the physical and cellular response to pain, alcohol and opiods

Melanoma research projects

- Investigating the use of adoptive T cell immunotherapy to target melanoma cells that have become resistant to B-ref inhibitor treatment in patients with metastatic melanoma
- Exploring whether the combination of B-raf inhibitor therapy and adoptive T cell therapy are compatible and complementary for the treatment of metastatic melanoma
- Developing a rapid whole blood assay for estimating immune responses to melanoma-directed immunotherapy

Novel cancer targeting research projects

- Using APOMAB® to target dead cancer cells for monitoring of cancer therapy
- Advancing APOMAB® for the delivery of radiation-based cancer therapies

Cancer-related research projects

- Development of microfluidic devices to isolate and analyse peripheral blood cell populations in pancreatic cancer patients
- Development of a novel functionalised solid support surface for the detection and analysis of antigen-specific polyfunctional T cell responses

More Information on Experimental Therapeutics Laboratory:
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Early Origins of Adult Health Research Group

Our research is in the area of pregnancy and fetal development, with a focus on the early origins of adult health and disease. Our research aim is to determine the mechanisms underlying the early programming of adult disease, with a focus on the impact of a poor environment before and during pregnancy in determining cardiovascular and metabolic health in adult life.

Current Projects

1. *Role of the Periconceptional Environment on the Timing of Birth*
   Dr Song Zhang, Prof Caroline McMillen and Dr Janna Morrison
   Preterm delivery remains a major health problem in western societies, with a global incidence of 5 to 10% and whilst there are a series of known pathways and risk factors which lead to preterm delivery, the mechanisms underlying preterm delivery are largely unknown and poorly understood. The hypothalamo-pituitary-adrenal (HPA) axis plays a critical role in fetal development. The HPA axis is essential for preparing the fetus for the transition between the intra uterine environment and the outside world. In long gestational species such as the human and the sheep the HPA axis is also involved in the hormonal cascade of events that signals the timing of parturition. Our research group has investigated the effects of altering the environment of the early embryo of the sheep in terms of in vitro culture (as part of assisted reproductive technologies). What we have found is novel in that altering the environment of the early embryo can alter the timing of parturition. We have shown that exposing an embryo to in vitro culture in the presence of serum can delay the timing of birth (a slowing of the HPA axis). There is evidence in the human literature to support these observations in the sheep model. One possibility is that there is a critical window during early embryo development that causes changes to either the DNA structure itself or the cascade or mechanisms that regulate the expression of genes of the HPA axis.

   This study will involve mapping the timing of birth in pregnancies resulting from *in vitro* culture and the growth of these lambs in the first 8wks of life. The response of the hypothalamic-pituitary-adrenal axis will be investigated in lambs at 8wks of age. Students will participate in the collection of blood and tissue samples and in drug challenge tests. Students will learn how to measure cortisol concentrations in plasma.

2. *Linking intrauterine growth restriction to proteins involved in metabolic syndrome in adult life*
   Dr Janna Morrison and Prof Caroline McMillen
   Being born small due to intrauterine growth restriction is associated with an increased risk of developing metabolic disorders in adult life. Previous studies have shown that the development of the liver before birth is significantly affected when fetal nutrient supply is low. Specifically, we have demonstrated that the expression of genes associated with

glucose production and metabolism are altered. If these changes persist in postnatal life, it may explain the underlying cause of the hyperglycaemia seen in the development of metabolic disorders in adult life.

We hypothesise that fetal growth restriction results in an increased expression of gluconeogenic enzymes which ones in the liver after birth. We propose to determine whether experimental induction of intrauterine growth restriction (IUGR) results in changes in hepatic expression of enzymes which regulate glucose homeostasis after birth using an animal model of IUGR.

This study will analyse the changes in protein expression via Western blot analysis in liver tissue that has previously been collected from 21 d lambs. The student will be involved in protein analysis via Western blot and/or immunohistochemistry.

3. *Does the preterm male fetus have greater cardiovascular vulnerability due to delayed cardiomyocyte maturation?*
   Dr Janna Morrison and Prof Doug Brooks
   In Australia, 7% of babies are born preterm. Males are more vulnerable during the transition to living outside the womb. They experience more cardiovascular instability. We hypothesise that there is a delay in the maturation of the heart muscle cells in male fetuses that put the preterm male fetus at increased risk of cardiovascular collapse. We have shown that there is a delay in the terminal differentiation of cardiomyocytes in male fetuses. This is important because terminally differentiated cardiomyocytes can only get bigger. They can't make more cardiomyocytes. But the undifferentiated cardiomyocytes, that can make more cardiomyocytes, can't create as much force with each contraction of the heart. The growth of cardiomyocytes is regulated by a range of growth factors including the insulin-like growth factors (IGFs). We hypothesise that there is a lower IGF-1 and -2 gene expression in hearts from preterm male fetuses and thus less activation of the IGF-1 receptor signaling pathway. This study will use real-time PCR, Western blots and immunohistochemistry to analyse gene expression as well as protein expression and distribtion.

4. *Maternal Obesity and the Pathway to Childhood Obesity*
   Prof Caroline McMillen and Dr Janna Morrison
   Currently more than half of all adults in Australia, including women of reproductive age are either overweight or obese. Women who enter pregnancy with a high Body Mass Index have an increased risk of delivering a large baby with a high body fat mass and these babies in turn, have an increased risk of becoming obese in early childhood and later adult life. Thus heavier mothers have heavier babies and these babies are at risk of developing childhood obesity and becoming obese adults. It is not clear, however, how maternal obesity causes later obesity in the offspring and initiates this intergenerational cycle of obesity. Maternal obesity may result in childhood obesity as a result of exposure of the early embryo, the developing placenta and/or the fetus to maternal over-nutrition. It is important to understand the effects of maternal over-nutrition on the embryo, placenta and fetus as this will influence recommendations on the timing and nature of nutritional interventions in pregnancy designed to limit the impact of maternal obesity on the intergenerational cycle of obesity. The student will assist in collection of plasma and tissue samples and investigate the impact of the intervention on fetal growth.

5. *Pharmaceutical Interventions in the Battle Against obesity*
   Prof Caroline McMillen and Dr Janna Morrison
   Evidence from a large range of clinical and population-based studies has shown that infants who are exposed to an increased supply of nutrients before birth have an increased risk of being overweight or obese as children and adults. It is not, however, fully understood why this occurs. In normal adults, factors released by fat cells play an important role in the maintenance of energy balance, and changes in the levels of these factors in the fat cell or in the circulation can lead to increased weight gain and the development of poor sensitivity of the body's tissues to the actions of hormones, such as insulin. Fat cells develop before birth, and it has been shown that increases in nutrient supply before birth can cause an early increase in fat deposition and may change the functional properties of fat cells for life. This very early increase in fat deposition may be an important link between fetal over-nutrition and the increased risk of obesity in postnatal life. In this proposal, we will investigate whether promoting an increase in fat deposition before birth in the absence of any change in nutrient supply is associated with changes in metabolic function before birth and an increased fat deposition and dysregulation of the appetite-regulating neural network in the brain after birth. Understanding the mechanisms which link the risk of obesity to events before birth will allow clinicians of the future to provide children who are born to overweight, glucose-intolerant or diabetic mothers with a healthy start to life.

   This project will involve studying the effects of rosiglitazone infusion during fetal life on postnatal development of metabolic function. Students will also perform real-time PCR to determine gene expression in tissues.

6. *What is the role of the IGF signalling system in heart development?*
   Dr. Janna Morrison and Doug Brooks
   In Australia, intrauterine growth restriction occurs in 7% of babies. Large studies show that these babies are at an increased risk of suffering from heart disease in adult life. The mechanisms that link these events are not clear. We have, however, shown that the IGF-1 receptor signalling pathway plays an important role in heart growth in late gestation and this pathway is altered in growth restricted fetuses. We hypothesise that up regulation of components of the IGF-1 receptor signaling pathway result in changes in heart development in growth restricted fetuses. This study will use Western blots and immunohistochemistry to analyse protein expression and distribtion. Ethics has been granted for this project as the tissues have previously been collected. The student will gain experience in animal handling, care and welfare, and Western and immunohistochemistry analysis of protein expression and distribution.

7. *Effects of Periconceptional nutrition (in vivo and ex vivo) on fetoplacental and postnatal development*
   Dr. Song Zhang, Prof Caroline McMillen and Dr. Janna Morrison
   A number of studies in the human and animal models have demonstrated that the period around the time of conception (oocyte and early embryo development and during early gestation), the periconceptional environment, can have a substantive impact on fetoplacental development. In particular, maternal under-nutrition/over-nutrition during the periconceptional period or exposure of an embryo to *in vitro* culture (involved in *in vitro* fertilisation and assisted reproductive technologies) can lead to an alteration in cardiovascular, renal and placental function. In addition, changes to the periconceptional environment during early embryo development may "program" the timing of birth. We are currently investigating how the environment of the developing embryo during the first

seven days of life causes changes in prenatal and postnatal growth, cardiovascular and renal function and the development of adult diseases such as cardiovascular disease and obesity. This project will use real-time PCR to analyse gene expression in tissue collected from fetuses and lambs that were exposed to a periconceptional insult, either maternal undernutrition in the 3 wks around conception or in vitro culture. The student will gain skills in animal handling and care as well as real-time PCR analysis of gene expression.

8. *Blood pressure regulation and heart rate variability: role of fetal growth and hypoxia*
   Dr. Janna Morrison and Prof Caroline McMillen
   Growth restricted fetuses have the same blood pressure as normally grown fetuses but are at increased risk of hypertension in adult life. This predisposition to hypertension is established in prenatal life when blood pressure regulation is more reliant on the sympathetic and rennin angiotensin systems. The role of hypoxia versus absolute growth restriction is not fully understood. This project will compare blood pressure, blood pressure regulation, heart rate and variability in heart rate in fetuses that are normoxic or hypoxic, normally grown or growth restricted.

9. *Expression of genes that regulate circadian rhythm in the male guinea pig*
   Dr. Janna Morrison and Dr. Dave Kennaway
   In Australia, 7% of babies are born low birth weight. These babies are at an increased risk of preterm delivery, neonatal death and infant death, including sudden infant death. This dysregulation of cardio respiratory control may be due to altered development of the circadian rhythm system. The mechanisms underlying this increased risk are not fully understood but the development of the circadian rhythm in these babies may be altered and thus play a role in their increased vulnerability. Interestingly, no studies have investigated the presence of a circadian rhythm in guinea pigs. Therefore, the melatonin rhythm and the expression of clock genes in the guinea pig fetus under normal development conditions and after fetal growth restriction will be investigated. We hypothesise that that clock genes will show circadian expression in the guinea pig. Real time PCR will be used to analyse the expression of several clock genes in the heart of male guinea pigs collected at 6 hourly intervals over a 24h period. The student will gain experience in animal handling, care and welfare and real-time PCR analysis of gene expression.

10. *Effect of placental restriction on surfactant development in early gestation*
    Assoc Prof Sandra Orgeig and Dr Janna Morrison
    This project is a collaboration between two research groups in the Sansom Institute for Health Research - the laboratory for 'Molecular & Evolutionary Physiology of the Lung' and the' Early Origins of Adult Health Research Group'. We have recently shown that surfactant protein and gene expression are reduced in late gestation in the growth restricted sheep fetus in a model of placental restriction. We wish to establish the timeline for this altered developmental trajectory, by investigating growth restricted fetuses during early and mid-gestation, in relation to their plasma glucose and cortisol concentration. In this project lung tissue and plasma from control and growth-restricted fetuses of placentally restricted sheep at various developmental stages will be analysed for alterations in surfactant protein and gene expression and plasma glucose and cortisol concentrations. The student will gain experience in animal handling, care and welfare, real-time PCR analysis of gene expression, Western analysis of protein expression and plasma cortisol and glucose assays.

11. *Role of nutrition on surfactant development in the fetus*
    Assoc Prof Sandra Orgeig and Dr Janna Morrison
    This project is a collaboration between two research groups in the Sansom Institute for Health Research - the laboratory for 'Molecular & Evolutionary Physiology of the Lung' and the' Early Origins of Adult Health Research Group'. In the placental restriction model, the growth restricted fetus experiences both nutrient and oxygen restriction (i.e. under-nutrition & hypoxia). We hypothesise that hypoxia has the dominant effect on surfactant maturation. To determine the contribution of under-nutrition alone, we wish to examine surfactant maturation in mid- to late gestation sheep fetuses exposed to maternal under-nutrition. In this project lung tissue and plasma from control and undernourished sheep fetuses will be analysed for alterations in surfactant protein and gene expression and plasma glucose and cortisol concentrations. Futhermore, babies born preterm or born small for their gestational age are at an increased risk of developing respiratory distress. We wish to establish the mechanisms and timing of surfactant maturation during late gestation in relation to environmental factors that lead to intrauterine growth restriction. We hypothesise that intrauterine growth restriction in the guinea pig induced by maternal under-nutrition or maternal hypoxia will reduce surfactant protein and gene expression in the lung of the late gestation guinea pig fetus. In this project lung tissue from control and intrauterine growth restricted guinea pig fetuses will be analysed for alterations in surfactant protein and gene expression.

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Mosquitoes and Public Health Research Group

Our research group's overarching aim is to improve the health of people and places. We work closely with government and interstate colleagues to provide expert advice on managing mosquitoes and the diseases they spread. Our research focus extends from the local to the global, from predicting and preventing Ross River Virus in South Australia, to studying the nature of tropical diseases such as Dengue Fever. We also have an interest in aerobiology and air quality. We use a broad range of techniques spanning field ecology, laboratory experimentation, epidemiology, and mathematical modelling.

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The Eumelanin Research Group

As a relatively new research group in the School of Pharmacy and Medical Sciences, we act as a bridge between Chemistry and Biology in our studies of eumelanin. Eumelanin is the black substance found in hair, feathers, fur and skin which has remarkable properties. For example it can act as a semiconductor and it is the best know biological sound-proofing material. What makes it even more interesting is the fact that its structure is as yet unknown. This is because of its insolubility in any solvent, its stability up to 300°C and its monotonous absorption of light across the spectrum.

Just as mysteriously, eumelanin is found in the inner ear of humans as well as in the *substantia nigra* of the brain where its functions are unknown. Our starting point was to note that the catecholamine neurotransmitter, dopamine, was secreted from the *substantia nigra*. As well as that, if left in an alkaline solution, dopamine oxidises to melanin.

Since those early beginnings three years ago, we have begun to investigate the dynamic chemical relationship between dopamine, DOPA (dihydroxyphenylalanine) and eumelanin. As our experimental material, we began by investigating squid and cuttlefish ink, which comprises eumelanin. Now we have expanded our work into mammalian eye melanin and human hair melanin. Along the way we have made some remarkable and surprising discoveries. Recently, our endeavours have been rewarded by being published as the feature article in the Journal of Chemical Ecology (November 2010), where we supplied the cover photograph of a South Australian squid eating a fish.

As well as the chemical side of things, our group has recently begun a collaboration with Museum Victoria where the Head of Sciences, Dr Mark Norman, is Australia's foremost cephalopod expert. Initially, we will be undertaking comparative studies of inking structures between cuttlefish, squid and octopuses. So, our interests range widely between marine biology and the chemistry of eumelanin and they promise to deliver insights of direct relevance to human health.

Dr Michael Kokkinn (Group Leader)

http://people.unisa.edu.au/Michael.Kokkinn

Dr Kokkinn's interests have diversified over the years into a variety of areas including native plant reproductive strategies; water rat behaviour; snake venom and squid ink.

He has developed a significant interest in cephalopod ink. This has led to a number of interesting questions, some of which may have significant medical importance. Consequently, projects on offer in my area are focused on studies of cephalopod ink melanin.

Dr Cobus Gerber (Group Leader)

http://people.unisa.edu.au/Cobus.Gerber

Dr Gerber joined the School of Pharmacy and Medical Sciences in 2004 and is involved in the teaching of chemistry courses across various programs. His research activities have focused on analytical techniques, although organic synthesis and reactivity remain an interest.

Group members:

Mr Frank Madaras MSc (Protein Chemist): http://people.unisa.edu.au/Frank.Madaras
Mr Frank Peddie MSc (Formulation Chemist): http://people.unisa.edu.au/Frank.Feddie
Mr Shaun O'Sullivan BSc (Behavioural Biologist)
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Endocrine Bone Research Laboratory

Studies in our laboratory investigate dietary and hormonal factors that influence bone structure and strength with a focus on prevention of osteoporosis. We are interested in the effects of oestrogen and the contribution of vitamin D metabolism to bone cell activities and the skeleton. We have developed a variety of laboratory rat and mouse models for these studies. These include oestrogen deficient and/or vitamin D depleted rats as well as various genetically-modified mouse models in which genes responsible for vitamin D activation or activity have been either added or removed from specific bone cell types. These models provide extremely useful models to study the effects of hormone status and nutrition in the whole animal including effects on skeletal structure and strength. As well these models provide a source of bone cells that can be cultured to either form bone mineral or resorb bone. These cultures are suitable for studying the essential genes required for such bone cell activities and to identify the molecular mechanisms involved. There are a number of projects that would be most suitable for an Honours degree program.

The major requirement for any student to be successful in our laboratory is a willingness to learn new techniques and the science of bone physiology. A background in physiology or some biochemistry would be helpful but is not essential.

Professor Howard Morris (Professor of Medical Science)
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I have a joint appointment with the University of South Australia and SA Pathology (Institute of Medical and Veterinary Science) where I am a Chief Medical Scientist in Chemical Pathology.

My research interests include calcium and bone physiology with a focus on vitamin D and oestrogen effects on the skeleton.

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Musculoskeletal Biology Research Laboratory

The major focus of our team is to tease out the reasons for why vitamin D and calcium influence bone structure and strength. My studies have important implications for osteoporosis treatments. Recently, we have recently identified novel roles for vitamin D on the regulation of bone cell proliferation and maturation as well as bone resorptive activity. I am keen to hear from potential students who may be interest in either *in vivo* mouse studies using state-of-the-art transgenic and cell-specific knockout mouse models of vitamin D activity. I am also interested to hear from students who are interested in *in vitro* cell studies to look at the effects of vitamin D metabolism on bone cell function as well as gene expression profiles. An honours student in my lab, you will benefit from integrative work which studies biochemical, hormonal,

and dietary interactions with quantification of skeletal structure, strength and bone cell activities including molecular signalling. You will work within a tight-knit team environment, each member of which has an overall desire to quantify the effects of direct and indirect activities of vitamin D on bone and to are focussed on providing scientific evidence for how vitamin D supplementation reduces the incidence of hip fracture in the elderly.

Dr Paul Anderson

http://people.unisa.edu.au/Paul.Anderson

I have a joint appointment between UniSA and SA Pathology. My laboratory is located within the division of Chemical Pathology, SA Pathology, which means student studying with us, gain the added advantage of observing how a routine pathology testing laboratory is run.

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Infectious Diseases and Microbiology Research Group

The Group conducts important research aimed at addressing a variety of biological challenges affecting human and animal health. They investigate the microbiological factors affecting a range of vital health issues including antibiotic resistance, food-borne disease, water quality and Rhodococcus equi. Headed up by prominent microbiologist Professor Mary Barton, the group conducts research on behalf of various industry bodies, and advises government with expert advice via groups such as the Expert Advisory Group on Antibiotic Resistance (EAGAR) and the CSIRO AAHL Security Assessment Group.

Dr Maurizio Costabile (Senior Lecturer)

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The immune system plays the central role in protecting us from pathogens that we encounter. In certain cases the immune system can become overactive and lead to allergy and autoimmune disease, while in other cases, defects in any aspect of the immune system can lead to immunodeficiency disease. The immune system also protects us from cancer. It is now appreciated that cancer cells evade rejection through suppression of the local immune response via a number of strategies. My laboratory has recently begun investigating the biological activity of the enzyme, indoleamine 2,3-dioxygenase (IDO). IDO is a central enzyme involved in tumour induced immune tolerance. As a result, any intervention that can modulate the expression and activity of this enzyme would be useful in the treatment of a wide array of cancers. Our research aims at better understanding the basic biology of IDO in leukaemia. By understanding how it is activated and controlled, we will be in a better position to identify possible ways of inhibiting the activity of this enzyme.

Dr Sumbo Ndi (Postdoctoral Research Fellow)

http://people.unisa.edu.au/Sumbo.Ndi

Sumbo is interested in the epidemiology, control and prevention of human food-borne diseases with particular interest in vaccine development. Her research also involves the epidemiology and mechanism of antibiotic resistance in animal and human bacteria.

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Malaria Research Lab

Dr Ellen Nisbet (Lecturer, Life Sciences)

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I am interested in the evolution of the malaria parasite, Plasmodium falciparum. Malaria infects several hundred million people worldwide each year, and kills one million. About 80% of all deaths caused by malaria are of children under the age of five. Many of the key anti-malaria drugs are now ineffective due to the spread of resistance. The malaria parasite Plasmodium, is a single celled eukaryotic pathogen. It contains a mitochondrion, as well as a remnant chloroplast called the apicoplast. The apicoplast is no longer able to carry out photosynthesis, yet is essential for the parasite's survival. Both the mitochondrion and the apicoplast have many prokaryote-like characteristics, due to their origins as endosymbiotic bacteria, enslaved about 1 1/2 billion years ago

My research examines how and why the mitochondrion and apicoplast are retained in Plasmodium. Understanding the function of these essential organelles is key to developing new anti-malarial drugs.

I am also interested in other organisms containing remnant chloroplasts. Many algae have closely related species that are not photosynthetic, yet contain chloroplasts. Some algae, such as dinoflagellates, are related to Plasmodium. Identifying why these organisms retain a chloroplast may also help understand Plasmodium cell biology.

Our lab also has an interest in other questions in evolution, and we are working with Archaeologists from the University of Cambridge. We have a number of projects examining the domestication of the horse, looking at the origins of the thoroughbred breed and are also solving mysteries in thoroughbred racing, such as is Eclipse, the fastest horse ever, really Eclipse? The phylogentic techniques we use in our work on the malaria parasite are the same as those used to solve these horse problems. Collaborative projects such as these are always great fun.

Potential projects could cover any of these topics: please contact me and we can discuss what might be possible. Interested students should have knowledge of molecular biology.

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Molecular and Evolutionary Physiology of the Lung Laboratory

The laboratory's key aim is to understand the evolution, molecular function and regulation of the pulmonary surfactant system, a complex mixture of lipids and proteins that forms a film at the air-liquid interface of the lung. Research projects cover a diverse range of innovations in health, from better care for premature babies and their mothers, to improved

treatments for respiratory disease, and preventing the spread of infectious diseases such as avian flu.

Current projects:

1. *Effect of hypoxia on lung and surfactant development in chicken embryos:*
   Egg-laying animals exposed to hypoxic conditions during crucial developmental windows hatch earlier and experience accelerated surfactant maturation. We use the hypoxic chicken embryo as one of our model organisms to investigate the timing, control and mechanisms by which hypoxia alters surfactant development. In this project lung tissue from control and hypoxic embryos at different developmental stages will be analysed for alterations in surfactant and regulatory gene expression.

2. *Effects of intrauterine growth restriction (IUGR) on surfactant maturation:*
   We are pursuing a range of projects in collaboration with the Early Origins of Adult Health Research Group to establish the impact of IUGR on the developing surfactant system. Babies born pre-term or born small for their gestational age are at an increased risk of developing respiratory distress because their pulmonary surfactant system is not fully developed. We wish to establish the molecular mechanisms by which hypoxia and nutrient restriction alter surfactant maturation during gestation in IUGR fetuses.

3. *Composition and function of lung surfactant in hibernating and torpid mammals:*
   Temperature alters the physical state of lipids at an air-liquid interface and the ability of surfactant to lower surface tension. However, many mammals reduce their body temperature when they enter a reduced metabolic state (e.g. torpor or hibernation) without suffering respiratory distress or surfactant dysfunction. This project uses biophysical techniques to examine molecular interactions of lipids and proteins from surfactant isolated from warm and cold mammals (e.g. bats, dunnarts).

Associate Professor Sandra Orgeig (Program Director, Bachelor of Medical Science)
http://people.unisa.edu.au/Sandra.Orgeig
Since joining the School of Pharmacy and Medical Sciences in 2007, Associate Professor Orgeig has expanded her research on environmental influences on the development of the surfactant system into the biomedical realm by developing collaborations with the Early Origins of Adult Health Research Group.

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VHL Group

Our lab is interested in microtubules, cancer and cancer suppressor molecules. We are interested in how some unique molecules called 'tumour suppressor proteins' influence

microtubule growth. We offer projects that study the molecular basis of the interaction of VHL (a protein which binds microtubule ends and stops them from shrinking) with microtubules. Premature shrinking of microtubules is associated with the uncontrolled cell division observed in cancer.

A background in molecular biology is a desired prerequisite for the types of projects pursued in our laboratory.

Dr Ben J Roberts (Group Leader)
http://people.unisa.edu.au/Ben.Roberts
Dr Roberts is a Senior Lecturer within the School of Pharmacy and Medical Sciences

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Venom Research Group

Dr Michael Venning (Senior Lecturer, Pharmacology)
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Research work at the University of South Australia has shown that certain snake venom toxins can inhibit yeast cell growth. Some of these venom inhibitors are postsynaptic neurotoxins. It is proposed to make use of this finding, and develop an assay capable of measuring antibody (or anti-venom) neutralisation of venom postsynaptic neurotoxins. The assay would involve combining yeast cells in a suitable growth media with pure snake venom postsynaptic neurotoxins which have been pre-incubated with anti-venom antibodies. The results of yeast growth would be measured against controls containing only the postsynaptic neurotoxins (no anti-venom), and also a yeast cells only control (no postsynaptic neurotoxins). Presently it is rather difficult to assay for venom postsynaptic neurotoxins neutralisation by anti-venoms. The assays are usually in vivo assays, and the results are often difficult to interpret.

A yeast cell based assay would provide a simple and efficient way for assaying postsynaptic neurotoxin inhibition by antibodies. Postsynaptic neurotoxins are a major family of toxins present in all of the snake venoms. In some venoms it is the major venom toxin, and mainly responsible for death in the envenomed victim.

Students interested in this research group are required to have a background in biochemistry, microbiology or pharmacology.

Associate Professor Anthony Woods (Cell Biology)
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The capacity to develop an adequate blood supply is essential for tumour growth, development and metastasis. In recent years considerable research activity has been directed towards understanding the mechanisms involved in the vascularisation of tumours (tumour angiogenesis) as the vasculature is seen as a promising avenue for developing anti-neoplastic therapies.

Current Projects:

Snake venom effects on tumour-associated microvascular endothelial cells

Collaborators: Dr Michael Venning, Mr Peter Mirschin (Venom Supplies), Prof Michel Richardson, Dr Freek Vonk (Leiden University, Netherlands)

Venoms are a rich source of novel peptides. Some snake species have provided compounds now used in a range of medical conditions including blood pressure and pain management while others have revealed compounds that target vascular cells. These are of particular interest to us as the vasculature in tumours is a significant potential anti-cancer target. It is known that the venoms from some exotic snake species contain agents including disintegrins and L-amino-oxidases which are able to initiate an apoptotic response in vascular endothelial cells. More recently a compound (VEGF F) with similarity to mammalian vascular growth factors (VEGF A) has been isolated from some venoms. We have identified agents in venoms from various Australian snakes which have also shown anti-vascular effects. In this project we are studying the venom regulation mechanisms in snake venom glands as a basis for mechanisms involved in the production of specific venom components. Our current work involves elucidating the molecular mechanisms that regulate the production of the venom components.

Regulation of ICAM-1 expression in tumour vasculature

It is known that tumour vasculature may exhibit a reduction in expression of adhesion molecules such as ICAM-1 a in response to inflammatory cytokines. A lack of adhesion molecule expression leads to severe diminution of leucocyte trafficking and thus such tumours are capable of evading immune cell response. In this project we are investigating the role of vascular growth factors in the suppression of adhesion molecules expression, specifically vascular endothelial growth factor A (VEGF A) and fibroblast growth factor (bFGF), on the tumour-associated vascular endothelial cells. As part of the investigation we are also examining the interaction between TNF-α, VEGF A and the transcription factor NF-κB which is known to be integral to the upregulation of ICAM-1.

VEGF-C expression and lymphangiogenesis

It is known that tumours are capable of stimulating lymphangiogenesis via specific endothelial mitogens including vascular endothelial growth factor C (VEGF C) and in some malignancies at least there is a correlation between VEGF C expression, metastasis formation and prognosis. VEGF-C operates through its receptor VEGFR-3 (and to a lesser extent VEGFR-2) however the interrelationship between VEFG-C, lymphangiogenesis and tumour progression remains to be elucidated. In this project we use recently developed marker antibodies for lymphatics, VEGF C and its receptor complemented by in situ hybridization studies to explore the role of lymphatics in tumour development.

Dr Miguel de Barros Lopes (Senior Lecturer)

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The yeast *Saccharomyces cerevisiae* has been used extensively as a model organism in medical research. The aim is to use yeast to investigate the activities of venoms and to develop novel antimicrobial therapeutics.

Group Members:

Mr Frank Madaras (Adjunct Research Fellow)
Mr Peter Mirtschin (Adjunct Research Fellow)
Prof R. Manjunatha Kini (Adjunct Research Professor)
Mr Andrew Beck (Technical Support)

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Neurophysiology and Human Movement Laboratory

Dr Gabrielle Todd (Senior Research Fellow)

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The control of voluntary movement engages much of the human neocortex. Goal-directed movements require awareness of where the body is in relation to where it intends to go, and selection of the appropriate plan to get there. Once a plan has been selected, it must be held in memory and then implemented at the appropriate time. The motor cortex is particularly important for voluntary movement. I'm interested in the role of motor cortex in movement disorders and the effect of illicit drug use on motor cortex function. I'm also interested in the neural mechanisms that contribute to exercise-induced fatigue.

Current Projects

Motor cortex and illicit drug use:

The term 'illicit drug' describes a drug whose production, sale, and possession are prohibited. In Australia, 38% of the population aged 14 years and over have used an illicit drug in their lifetime. There has been extensive investigation of the effect of illicit drug use on cell function, mental health, and cognition. For example, the prevalence of mental health disorders in adults with recent illicit drug use is 60-76% higher than for the general Australian population. Given that the same neurotransmitters are involved in cognition and movement, it is likely that illicit drug use also affects motor pathway function. The aim of this project is to investigate the effect of illicit drugs on motor cortex function and movement. This work may provide an objective measure of the functional brain damage arising from illicit drug use.

Fatiguing exercise and hand function

Lifting and holding an object requires a grip force that is sufficient to overcome the effect of gravity on the object and prevent slipping, without damage to the object or unnecessary muscle fatigue. The aim of this project is to investigate the effect of fatiguing exercise on the ability to lift and hold an object.

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Professor Richard Upton (Pharmacometrics)

http://people.unisa.edu.au/Richard.Upton

Professor Upton is interested in using computer models to describe physiological and pharmacological systems. Models can be used to integrate knowledge so that complex experimental systems and data can be understood and interpreted.

Two projects are available:

1. Construct and test a computer model of drug kinetics in an isolated perfused kidney preparation. This is a common experimental preparation for examining the renal handling of drugs in vitro. Drug in blood passing through the kidney is filtered, actively excreted or actively reabsorbed. Can a computer model be developed as a tool for estimating the

rates of these processes for particular drugs? How well does this in vitro data reflect what happens in vivo?

2. Construct and test a computer model of the Vitamin D absorption, synthesis and degradation pathways. While the biology of Vitamin D is well understood, this information needs to be integrated into a quantitative model so that the relationship between sunlight exposure, dietary Vitamin D and time can be explored and simulated. The need for Vitamin D supplementation is a currently a hot topic, with recent findings that many elderly people have health consequences from Vitamin D deficiency.

Both projects involve the analysis of pre-existing and literature data.

Interested students should be competent computer users with some mathematical ability. The projects will make use of the easy to learn, graphical interface software "Berkeley Madonna".

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Associate Professor Jennifer Keogh (Dietetics and Nutrition)

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Jennifer's research interests are in obesity, diabetes and heart disease in particular on the effects of salt on vascular function and in developing strategies for reducing salt intake. She conducts human dietary intervention studies.

Projects for 2012 include:

- Salt and health: assessing the effects of a high salt meal on measures of vascular function
- Salt and health: assessing salt intake and sources of salt in people with celiac disease

These projects would suit students who have an interest in diet and nutrition and have a science, food, nutrition or health sciences or background.

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Professor Jason White (Drugs of Dependence)

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My research focuses on the pharmacology of drugs of dependence, particularly opioids and stimulants. We have a laboratory to measure physiological, behavioural and cognitive function in human subjects, both volunteers and clinical populations. The clinical groups include people being treated for drug dependence and pain patients who are prescribed opioids. We also conduct clinical trials in these populations at treatment centres in Adelaide.

Our research has two main aims. The first is to characterise the adverse effects of long term use of opioids and stimulant drugs. For example, we have shown that prolonged opioid use in the

context of either pain treatment or addiction increases sensitivity to some types of painful stimuli. This opioid-induced hyperalgesia may play an important role in maintaining long term patterns of opioid use. In future research we will examining the factors that predict the degree of hyperalgesia (e.g. pharmacogenetic factors) and pharmacological strategies to reduce hyperalgesia. Another project involves collaboration with cognitive psychologists to characterise the impairment in function arising from chronic opioid use and the relative effects of partial and full agonists.

The second aim is to improve current treatments for drug dependence and pain. Several strategies are being used. One is to improve medication adherence and reduce the variation due to pharmacokinetics by using long acting formulations of drugs currently employed in treatment. For example, we conducted the first trial of a buprenorphine implant that provided therapeutic concentrations of the drug over a 6 month period. A second strategy has been to trial novel drug combinations. For example, we showed the efficacy of combinations of buprenorphine with ultra-low doses of opioid antagonists. This was the first definitive study to demonstrate that a combination shown in animal models to reduce opioid requirements and decrease the development of tolerance was also effective in humans. We have also used pharmacogenetic approaches to examine how opioids can best be used to minimise risks of dependence.

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Dr Giordana Cross (Dietetics)

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Major areas of interest include:

1. Chronic obstructive pulmonary disease (COPD) is a major contributor to morbidity and mortality in Australia. Progressive deterioration in lung function can influence a person's ability to consume sufficient food to meet their nutritional needs, which may be increased due to their disease. This in turn can lead to the development of malnutrition and potentially an increased risk of the development of infection and hospitalisation. Optimising nutrient/ food intake is therefore important. Gaining a better understanding of the factors that influence food and fluid consumption in people with COPD who are developing difficulties with their eating is therefore important. This understanding would contribute to the development of strategies that could improve nutrient intake and thus nutritional status in this group of people. **The project in this area will involve the investigation of these factors using a qualitative approach together with the collection of some nutritional data.** The project will develop skills in qualitative research and significantly contribute to the understanding of the factors influencing food consumption in this area.

2. Women's' health focusing on weight management, PMS and appetite and the use of nutritional supplements by women. A potential project is investigating the range of supplements being used by women, the reasons for use and sources of information that lead them to this use.

3. Nutritional knowledge of health professionals and how they use this in their day to day interaction with their clients/ patients.

Students are required to have nutrition knowledge and interest in nutrition related research.

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Dr Julie Stevens (Gastrointestinal Physiology)

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My research interests relate to the study of normal and disordered gastrointestinal motility in health and diabetes, with a particular focus on oral drug absorption and glycaemic control. Much of my work has focussed on investigations of pharmacological and nutritional interventions on gastric emptying rate, antropyloroduodenal motility and glycaemia in humans, particularly in patients with diabetic gastroparesis. My research incorporates a diverse range of medical imaging methods, including scintigraphy, ultrasonography and manometry, in the measurement of gastrointestinal motility. Other areas of research include pharmacokinetic studies of orally administered agents and their potential use as alternative measures of gastric emptying rate. More recently, my research has concentrated on the physiology of the incretin hormones (GLP-1 and GIP) and the mechanisms by which incretin-based therapies (GLP-1 agonists and dipeptidyl-peptidase-4 inhibitors) improve glycaemic control in diabetes mellitus.

Current project:

The rate of gastric emptying is a major determinant of alcohol absorption and the glycaemic response to a meal. The aims of this study are to determine the effects of low-carbohydrate, full-strength and low-alcohol beer on gastric emptying, alcohol absorption and glycaemia in health and type 2 diabetes.

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Dr Permal Deo (Molecular Biology)

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I am interested in the advanced glycation endproduct (AGE) as biomarkers of oxidative stress. Protein glycation/lipoxidation are irreversible modifications of protein resulting in the formation of adducts called advanced glycation endproducts (AGEs) and advanced lipoxidation endproducts (ALEs) respectively.

Glycation occurs *in vivo* during aging, and has been implicated in diabetes and renal dysfunction. High concentrations of AGEs in the body are associated with chronic clinical complications e.g., cataract formation, macrovascular disease, diabetic retinopathy, renal insufficiency and Alzheimer's disease. AGE/ALEs may exert their effects on cellular function via interaction with specific receptors including the receptor for AGE (RAGE). Ligation of AGE by RAGE induces generation of reactive oxygen species and leads to the activation and

translocation of NF-kB. NF-kB activation in turn onsets a cascade of transcriptional genes eg., TNFa, IL-1, IL-6, VCAM-1 and VEGF. Interestingly, AGE/ALEs are also formed in thermally processed food. The contribution of exogenously-formed dietary AGE/ALE to an individual's physiological AGE/ALE load is currently a subject of intensive research since the amounts of AGE/ALE ingested in the normal diet by healthy subjects are reported to be much higher than those in plasma and tissues.

My research examines AGE-induced signaling cascade mediated by natural products. The role of these products as antioxidants and their potential anti-inflammatory activities will enable better understanding on the mechanism in preventing or delaying the onset of chronic diseases. One of my interests is to study the role and functions of Australian Native Foods in these signaling cascades.

I am also interested in antimicrobial properties of natural products. The research also examines microbial analysis using molecular techniques in food and environmental samples.

Two possible Honours topics are:

1. Inhibitory effects of native plant extracts on *in vitro* protein glycation.
2. Potential of Australian native foods in the management of hyperglycemia and hypertension using *in vitro* models

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Dr Nenad Petrovic (Pharmacology)

http://people.unisa.edu.au/Nenad.Petrovic

Dr Petrovic offers projects that investigate molecular mechanisms by which novel drugs influence tumorigenic processes including angiogenesis. The exact projects available depend on the current research interests.

Current projects:

Metabolites of omega-3 polyunsaturated fatty acids as new suppressors of blood vessel formation

This project investigates effects of metabolites derived from omega-3 polyunsaturated fatty acids (omega-3 PUFA) that are able to suppress all major processes involved in pathological activation of vascular growth (angiogenesis). In our previous work we determined that omega-3 PUFA inhibit angiogenic processes through formation of omega-3 PUFA-derived metabolites, although specific, most active metabolites, are yet to be identified. These metabolites will further serve as leading compounds for development of more effective treatments for proliferative diabetic retinopathy and cancer.

Suppression of tumour cells growth and tumour-related physiological processes by proton pump inhibitors

Drug therapy of breast cancer is very complex and with limited success rate. This proposal will investigate supplementary therapy to standard chemotherapeutic treatment involving inhibition

of proton pumps in breast cancer cells in vitro. Tumours exhibit increased intracellular acidification that could lead to cell death. Such acidification is compensated by rapid removal of protons by proton pumps. Proton pump inhibitors might become important addition to the current cancer therapy due to their low cost, minimal toxicity, high efficacy, minimal side effects and large clinical experience in their use for treatment of peptic diseases.

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Dr Annet Hoek (Nutrition)

http://people.unisa.edu.au/Annet.Hoek

Current projects:

Environmentally sustainable foods and food choices

Collaborators: Wageningen University, The Netherlands

The type and amount of foods we nowadays consume have a major impact on the environment: food production requires land, water, fertilizers, energy, and results in increased emissions and environmental pollution. It is felt that consumers need to change towards a more sustainable food consumption pattern, which is proven to be difficult. In our research we therefore focus on consumer acceptance of these foods and other factors that influence sustainable food choices. In past studies we have looked into meat substitutes as an environmentally friendly alternative for meat. In future studies we will investigate how an environmentally sustainable food choice can be made the easy choice, by better understanding food substitution behaviour.

Improving the nutritional intake and mealtime experience of sick and older adults

Collaborators: Sandra Ullrich (project leader), School of Nursing and Midwifery, University of South Australia; Art, Architecture & Design + Health and Wellbeing Research Group, University of South Australia

Eating and the enjoyment of a meal at home or restaurant meal is normal for the most of us….but this might not be the case when you are in hospital or reside in a nursing home. Under nutrition is now considered as one of greatest threats to health, wellbeing and autonomy of sick and older adults. Specifically vulnerable are patients with dysphagia (a medical term defined as "difficulty swallowing"), which may affect up to 15% of the total geriatric population and up to 40% of the institutionalized elderly population. To maintain safe oral intake, a changed texture of solid food and liquids may often be necessary in the management of dysphagia, which may be done in varying degrees. Texture modification of foods leads to a strong dissociation from what is generally considered as 'a meal' and with that the enjoyment of eating a meal and thus nutritional intake diminishes as well. The current project investigates a new food preparation system for texture-modified foods, and how this impacts nutritional intake and the meal experience of residents with dysphagia.

Future projects will investigate the impact of redesigning the meal environment (e.g. plates, utensils, trays, tablecloth but also interior design, smell, noise, and so on) on the meal experience of different consumer groups in hospitals and residential aged care.

What is a meal? The role and meaning of the meal in consumer experiences and food acceptance
Collaborators: Evangeline Mantzioris, University of South Australia
We talk about meals, we eat meals every day, but what do we actually mean by 'a meal'. In this research project we investigate what defines a meal: e.g. is eating a platter of sandwiches together with your family more of a meal than eating a hot take-away meal on your own? By assessing the essence of a proper meal according to consumer perceptions, we can re-evaluate and improve situations in which normal meal patterns might be violated, such as in hospitals, aged care settings, schools.

Social media mining: how consumers 'talk' about foods and meals
If you want to understand food consumers, you cannot ignore the new ways of consumer communication. Social media has experienced explosive growth over the past 2 years; e.g. 80% of European youth (<25years) are social media active (Eurostat, 2011), and includes social networks, twitter, blogs, forums and review / opinion sites. There is now a vast amount of consumer-generated content available, including articulated experiences with food products and services. In this study we investigate the opportunities and challenges for using social media mining (i.e. observational research on online consumer comments) as a food consumer research tool. We focus on how consumers evaluate different out-of-home eating settings, comparing hospital foods, airline foods, meals in restaurants and in canteens.

These projects would suit students who have an interest in consumer behaviour with respect to foods, nutrition, health and/ or environmental sustainability.

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Dr Evangeline Mantzioris (Nutrition)

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Current projects:

What is a meal? The role and meaning of the meal in consumer experiences and food acceptance
Collaborators: Annet Hoek, University of South Australia
We talk about meals, we eat meals every day, but what do we actually mean by 'a meal'. In this research project we investigate what defines a meal: e.g. is eating a platter of sandwiches together with your family more of a meal than eating a hot take-away meal on your own? By assessing the essence of a proper meal according to consumer perceptions, we can re-evaluate and improve situations in which normal meal patterns might be violated, such as in hospitals, aged care settings, schools.

Can we improve people's omega-3 status without them eating more fish?
Collaborators: Dr Beverly Muhlhausler, University of Adelaide; Prof Bob Gibson, University of Adelaide
The importance of diet for the prevention and management of cardiovascular disease is well recognized. Health agencies across the world recommend lowering the intake of saturated fat

intake by replacing animal fats with polyunsaturated vegetable oils, and increasing the intake of fish and fish-oils (which contain high amounts of omega-3 fatty acids) in order to improve heart health.
Whilst this approach is effective in individuals, many Australian's find it hard to eat enough fish, and, even if they did, there aren't actually enough fish left in the world's oceans to supply these needs for too much longer.

Luckily, omega-3 fatty acids are also found in other foods, and the amount of omega-3 fatty acids that most Australians already eat is likely to be enough to protect against cardiovascular disease if it wasn't for the high level of omega-6 fats in typical Australian diets. This is because omega-6 fats compete with omega-3 fatty acids for incorporation into tissues, which is necessary for them to have biological effects.

This project aims to show that reducing the intake of omega-6 fats will result in increased omega-3 incorporation into tissues and protection against cardiovascular disease without the need to increase fish or fish-oil intake.

Assessing community pharmacists' knowledge of The WHO International Code of Breast Milk Substitutes

Collaborators: Dr Michael Wiese, University of South Australia; Prof Bob Heddle, IMVS
The WHO International Code of Breast Milk Substitutes (1981) is a voluntary code that Australia is a signatory to. It outlines the obligations and responsibilities of breast milk substitute producers and health-care workers, including pharmacists. This study will be investigating the current knowledge and practices of community pharmacists regarding infant feeding practices and The WHO International Code of Breast Milk Substitutes. It is hoped that the findings will guide continued educational program planning for pharmacists.

The project will be investigating what the current knowledge level of community pharmacists of the WHO International Code of Breast Milk Substitutes and infant feeding practices? Secondly this project will investigate if pharmacies in South Australia adhere to the advertising and display of infant formulas set out in the code (Article 5.2).

Improving the nutritional intake and mealtime experience of sick and older adults

Collaborators: Sandra Ullrich (project leader), School of Nursing and Midwifery, University of South Australia; Annet Hoek, university of South Australia; Art, Architecture & Design + Health and Wellbeing Research Group, University of South Australia
Eating and the enjoyment of a meal at home or restaurant meal is normal for the most of us….but this might not be the case when you are in hospital or reside in a nursing home. Under nutrition is now considered as one of greatest threats to health, wellbeing and autonomy of sick and older adults. Specifically vulnerable are patients with dysphagia (a medical term defined as "difficulty swallowing"), which may affect up to 15% of the total geriatric population and up to 40% of the institutionalized elderly population. To maintain safe oral intake, a changed texture of solid food and liquids may often be necessary in the management of dysphagia, which may be done in varying degrees. Texture modification of foods leads to a strong dissociation from what is generally considered as 'a meal' and with that the enjoyment of eating a meal and thus nutritional intake diminishes as well. The current project investigates a new food preparation system for texture-modified foods, and how this impacts nutritional intake and the meal experience of residents with dysphagia.

Future projects will investigate the impact of redesigning the meal environment (e.g. plates, utensils, trays, tablecloth but also interior design, smell, noise, and so on) on the meal experience of different consumer groups in hospitals and residential aged care.

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Dr Hugo Albrecht (Pharmaceutical Science)

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Dr Albrecht has a strong interest in the development of cell-based assay systems for pre-clinical drug discovery, with considerable experience gained in both commercial and academic settings. The developed systems are designed for High-Throughput Screening (HTS) to identify novel candidate drugs, and for compound profiling at later development phases during lead optimisation. Within the laboratory there is an emphasis on the use of molecular and cellular biology techniques, and possible projects include assay development, and the application of established and novel genetically encoded fluorescent probes for functional monitoring of drug target activities. This would involve establishment and use of various fluorescence technologies for assay read out. The selected drug targets will be ion channels and transcription factors relevant to the treatment of pain and inflammation. In addition to this, some projects could address the development of new molecular approaches to the systematic generation of stable cell lines for HTS and other applications.

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Dr Larisa Bobrovskaya (Neuroscience)

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I am a neuroscientist who is interested in the function of catecholamine producing cells in health and disease. My current research interests include:

- The molecular mechanisms responsible for degeneration of dopaminergic neurons in Parkinson's disease
- Neural pathways that control the release of catecholamines from the adrenal medulla in response to hypoglycaemia
- The role of dopaminergic pathways in opioid-induced hyperalgesia (in collaboration with Dr Irina Majumder and Prof Jason White)

In my research I am using cell cultures, animal models and post-mortem human brain samples from Parkinson's disease patients.

Several projects are available related to these topics.

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Dr Karma Pearce (Nutrition)

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Major areas of interest include:

1. The use of high protein diets to reduce/ prevent obesity, diabetes and CVD
2. The use of probiotics and prebiotics to improve human health
3. The influence of diet and lifestyle to promote success at University

Current projects include:

ProViva Study

This project will investigate the use of Blackmore's Women's Bio Balance probiotic to treat harmful gram negative bacteria and augment IVF pregnancy rates. It is envisaged that probiotics will reduce these Gram negative bacteria which in turn produce large amounts of a potent immune stimulating agent called "endotoxin'. Endotoxin is highly toxic to embryos, even in minute concentrations. Endotoxins in cervical mucous are likely to be introduced into the uterus at the time of embryo transfer- creating a "sterile" inflammatory reaction that will impede embryo attachment. Probiotics are also thought to reduce harmful Gram negative bacteria which result in chronic inflammatory reactions in the cervix and cause inflammatory (white blood cell) mediated damage to sperm- impeding natural conception.

While Lactobacilli probiotics have been shown to be an effective primary treatment in reducing vaginal gram negative bacteria this treatment has not been linked in increased fertility rates. We aim to measure:

1. Primary Outcome- medium term (4 week) cure rates of harmful gram negative bacteria at the time of embryo transfer examination.
2. Secondary Outcome- implantation rate at 8 weeks gestation as assessed by pelvic ultrasound (implantation rate = number of viable fetal hearts seen on scan divided by the total number of embryos transferred x 100, expressed as a %).

This project is funded by Blackmore's and will be conducted at Repromed

Collaborators: A/Prof Kelton Tremellen (Deputy Medical Director at Repromed).

Barriers to healthy Eating

This study will explore the barriers to healthy eating in an undergraduate student population through the use of qualitative mixed methods to understand the experiences, opinions, and perceived barriers to healthy eating for students.

A survey of a diverse range of student groups will be undertaken using an appropriate validated survey instrument. This would be followed by a series of targeted focus groups aimed at clarifying points raised by the survey data with a particular focus on further investigating the issues related to campuses and study per se (e.g. access to healthy foods after hours).

Primary/ secondary outcomes:
This study will provide an understanding of the factors influencing students' selection of food and their perceived barriers to purchasing and / or consuming a healthy diet. Information from this study will assist in the development of further healthy eating opportunities and initiatives at UniSA and would be presented to the OHSW unit.

Collaborators: Dr Janette Young, Dr Giordana Cross

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