THE UNIVERSITY OF SYDNEY

Honours Projects

2022

Sydney Pharmacy School, Faculty of Medicine and Health

THE UNIVERSITY OF SYDNEY

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Professor Johannes (Jan-Willem) Alffenaar

Professor Jan-Willem Alffenaar is a hospital pharmacist and clinical pharmacologist. The research of his group focuses on personalised dosing of drugs to optimise efficacy and reduce toxicity. Therapeutic drug monitoring, pharmacokinetic modelling in combination with limited sampling strategies and dried blood spot or saliva sampling are tools to achieve these goals.

- **Contact:** Johannes.alffenaar@sydney.edu.au/johannes.alffenaar@health.nsw.gov.au
- **Location**: Westmead hospital
- **Academic Profile**: Professor Jan-Willem Alffenaar (sydney.edu.au)
- **Research Group**: 1 postdoc and 3 PhD students

Project 1: Feasibility of using saliva for therapeutic drug monitoring for levetiracetam

Co-Supervisors: Dr Hannah Yejin Kim and Dr Sophie Stocker

Project Summary: Levetiracetam is a second-generation antiepileptic drug used to control partial, tonic-clonic and myoclonic seizures. Therapeutic drug monitoring (TDM) of levetiracetam in blood is recommended in selected patients at a risk of altered drug exposure, such as pregnant women, renal impairment, drug-drug interactions, elderly and neonates.

Testing of saliva could allow an alternative non-invasive, point-of-care TDM approach. Studies have reported the presence of levetiracetam in saliva and correlation between saliva and plasma levetiracetam concentrations. The aim of the project is to:

1) perform a literature review to provide an update on TDM of levetiracetam.

2) develop an analytical assay to measure levetiracetam in saliva on a portable UV spectrophotometer (Nanophotometer NP80, Implen, Germany). A successful method development would lead to an analytical assay validation according to FDA and EMA guidelines.

We will collaborate with A/Prof Andrew Bleasel (a neurologist at Westmead Hospital) for this project.

Techniques/Methods: systematic literature review, analytical assay development, statistical analysis and manuscript writing. **Selected publications**: Sourbron et al. Seizure. 2018 Nov;62:131-135. Mecarelli O et al. Ther Drug Monit. 2007 Jun;29(3):313-8.

Project 2: Dosing of antimicrobial drugs in special patient populations

Co-Supervisors: Dr Hannah Yejin Kim and Dr Sophie Stocker

Project Summary: Suboptimal antimicrobial treatment is associated with treatment failure, adverse events and prolonged hospital stay. Therapeutic drug monitoring (TDM) is a procedure to tailor the dose based on the drug concentration in order to optimise treatment in individual. Patients who often don't respond optimally on a standard antimicrobial dosing regimen like patients in the ICU, patients with renal impairment, obese patients, elderly and neonates may benefit from TDM to facilitate personalised dosing. Retrospective studies are important to describe the problem in a particular setting as results from other hospitals may not be applicable for Westmead Hospital because of a different patient population or severity of disease. Development of easy-to-use saliva-based assays are important for the detection of patients at risk for suboptimal therapy. Several antimicrobial drugs are present in saliva and a correlation between saliva and plasma drug concentrations has been reported. The aims of this project are:

1) a literature review to provide an update on TDM of antimicrobial drugs in a specific patient population. AND one of the following:

A. develop an analytical assay to measure the antibiotic concentration in saliva on a portable UV spectrophotometer (Nanophotometer NP80, Implen, Germany). A successful method development would lead to an analytical assay validation according to FDA and EMA guidelines.
B. A retrospective study will be conducted in a specific patient population for a selected antimicrobial drug. The aim is to describe treatment outcome and adverse effects in a specific patient population. This will provide opportunity to optimise treatment in patients who need it most.

Techniques/Methods: systematic literature review, retrospective study, analytical assay development, statistical analysis and manuscript writing. **Examples of publications**: Kim *et al* Eur Respir J. 2021 Jan 28;57(1):2002349. Alffenaar *et al* J Antimicrob Chemother. 2021 Jan 19;76(2):423-429.

Associate Professor Thomas Balle

I am passionate about ion-channel drug discovery and computational drug discovery methods. My research aims to characterise new drug targets and identify new lead molecules and drugs that can help treat patients suffering from mental health disorders.

- **Contact**: thomas.balle@sydney.edu.au
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- **Research Group**: 4 Postgraduate Students

Project: Open Sesame: a computational tale of the P2X7 receptor - P2X7 receptors and inflammation: computational studies and virtual screening

Co-Supervisors: A/Prof Stephen Fuller, Nepean Clinical School; Mr Jake Chen, Sydney Pharmacy School

Project Summary: The P2X7 receptor is an ion channel involved in the host immune response to infection; however, over-activation of the receptor can lead to the formation of a “super-open” state, resulting in a damaging cytokine storm associated with sepsis and acute respiratory distress syndromes which are common in influenza and COVID-19 infections. In this project we will search for negative allosteric modulators of the P2X7 receptor and use computational and structure guided drug design methods to identify potential novel modulators which prevents the formation of the “super-open” state of the P2X7 receptor.

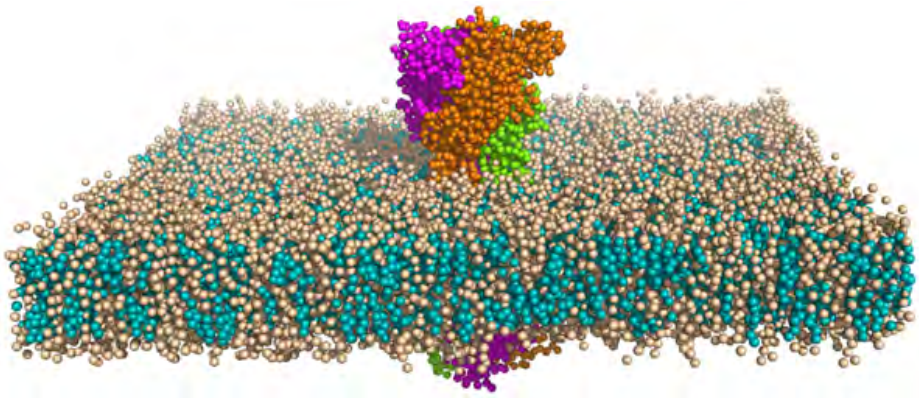

Figure: P2X7 receptor within an epithelial cell membrane.

Techniques/Methods:
Molecular modelling software for ligand and structure based virtual screening. High performance computing, 3D-visualisation, scripting/basic programming, molecular dynamic (MD) simulations.

Selected Publication:
Kopp, R. et al, P2X7 Interactions and Signaling – Making Head or Tail of It: https://doi.org/10.3389/fnmol.2019.00183

Professor Sinthia Bosnic-Anticevich

I am Research Leader of the Quality Use of Respiratory Medicines research group and a specialist respiratory pharmacist. Our group specialises in everything to do with respiratory and medicines use and we are globally recognised as leaders in this field. Our research has established the "gold standards" for the use of respiratory inhalers; informing inter/national respiratory treatment guidelines, which are used by health care professional all over the world, every day. We are known for our innovative approach, thought-leadership and mentoring of early/mid-career researchers.

- **Contact:** sinthia.bosnic-anticevich@sydney.edu.au**;** 0414 015 614
- **Location**: Woolcock Institute of Medical Research, 431 Glebe Point Road, Glebe
- **Academic Profile**: https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/sinthia-bosnic-anticevich.html
  https://www.woolcock.org.au/our-people/professor-sinthia-bosnic-anticevich
- **Research Group**: Quality Use of Respiratory Medicines Group: 3 respiratory clinician-researchers, 4 postdoctoral research fellows, 2 PhD students, 1 MPhil student, 1 Honours student

Project 1: Respiratory inhalers and the Environment

Co-Supervisors: Dr Biljana Cvetkovski (WIMR), Prof Omar Usmani (Imperial College, London, UK), Prof Nicholas Roche (University Paris Descartes, Paris, France)
Project Summary: Over 19 million respiratory inhalers sold to patients in Australia with asthma and/or chronic obstructive pulmonary disease. Most of these inhalers are pMDIs (pressurised metered dose inhalers). Over the last few years there has been a global move to produce more 'environmentally friendly' inhalers. In 2019 the UK government directed that at least 50% of prescribed inhalers should be of low global warming potential by 2022, recommending that patients using pMDIs be switched to another inhaler type. Switching inhalers is linked to worse disease outcomes and reduced adherence. The aim of this research to explore patient perpectives on inhaler switching, climate change and impact on personalised asthma management plans.
Techniques/Methods: Cross-sectional, observation study design involving the distribution, analysis and reporting of an online national survey of patients with asthma and COPD.

Project 2: Raising the rate of referral for undiagnosed severe asthma patients

Co-Supervisors: Dr Biljana Cvetkovski (WIMR), Dr Pamela Alphonse (WIMR)
Project Summary: Patients with Severe Asthma require a specific diagnosis and medications. Currently Severe Asthma patients often live with their asthma for many years before receiving this specific diagnosis. This project aims to develop referral pathways by which pharmacists identify patients at high risk of Severe Asthma and refer them to the GP for diagnosis. Before this can be achieved, we need a better understanding of the barriers to early Severe Asthma diagnosis. This Honours project focuses exploring the journey of people who have already been diagnosed with Severe Asthma to better understand their path to diagnosis and in particular, their experiences with their medications.
Techniques/Methods: Qualitative research methods ie in-depth semi-structured interview with patients with a severe asthma diagnosis.

Dr Rose Cairns

My research focus is poisoning, clinical toxicology, and epidemiology. I am a Senior Lecturer in the School of Pharmacy, and a practicing poisons information specialist. My overall goal is to reduce harm from poisonings.

- **Contact**: rose.cairns@sydney.edu.au (I am currently on maternity leave until Feb 2022, but will make time to meet prospective students via Zoom)
- **Location**: S303, Pharmacy Building A15
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- **Research Group**: 3 PhD students, 1 MPhil student.

Project 1: Evaluating the effect of re-scheduling of cannabis and nicotine on poisonings

Co-Supervisor: Prof Nicholas Buckley (USYD SOMS, Biomedical Informatics and Digital Health)
Project Summary: The TGA has recently changed the scheduling of cannabis/tetrahydrocannabinols and nicotine, in response to increasing demand for access to medicinal cannabis and nicotine vaping products. Cannabis and tetrahydrocannabinols are now Schedule 8, with certain conditions. Cannabidiol is in Schedule 4 and Schedule 3. Nicotine vaping products require a prescription and can now be purchased from pharmacies and imported from overseas. It is illegal for other retailers (e.g. tobacconists, 'vape' shops) to sell nicotine vaping products.
Scheduling changes alter access to substances, which can have a variable effect on harms, including poisonings, which we have demonstrated previously. This project will evaluate the impact of re-scheduling on Poisons Information Centre calls.
Techniques/Methods: Epidemiology, data analysis & visualisation (NSW Poisons data), clinical toxicology.
Selected Publication: Cairns R, Schaffer AL, Brown JA, Pearson S-A, Buckley NA. Codeine use and harms in Australia: evaluating the effects of re-scheduling. *Addiction*, 2020 115: 451– 459.

Project 2: Methotrexate daily dosing errors: have the interventions reduced poisonings and deaths?

Co-Supervisor: Prof Nicholas Buckley
Project Summary: Accidental daily dosing of methotrexate can result in life-threatening toxicity, with death reported from as little as three consecutive days of dosing. From 2004-15, we identified 92 poisonings and 22 deaths from inadvertent daily dosing of methotrexate, with cases increasing in 2014-15. Following our publication, a range of changes were made to the methotrexate CMI, Product Information, and pack labelling. Alerts were also sent out to medical practitioners and pharmacists. This project will provide an update, with data from 2016-2021, to see whether these changes have reduced poisonings and deaths from methotrexate.
Techniques/Methods: Data analysis & visualisation (Poisons, Coronial and PBS data), clinical toxicology.
Selected Publication: Cairns R, Brown JA, Lynch AM, Robinson J, Wylie C, Buckley NA. A decade of Australian methotrexate dosing errors. *Med J Aust.* 2016 Jun 6;204(10):384.

Dr Ronald Castelino

My research mainly focusses on quality use of medications in people with kidney disease and current ongoing projects include an exploration of adherence to medications among people with kidney disease, reporting of adverse drug reactions, factors influencing outcomes of peritonitis in peritoneal dialysis patients, clinical characteristics of patients with acute kidney injury, psychosocial issues affecting end-stage kidney disease patients and optimising the use of antimicrobials. Projects usually involve patients at Blacktown hospital.

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- **Academic Profile**: https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/ronald-castelino.html#collapseprofileresearchinterest
- **Research Group**: 2 PhD students, 2 MPhil students (hospital and community pharmacists), 1 Honours student (nursing)

Project 1: Community-acquired acute kidney injury induced by drugs at Blacktown Hospital

Co-Supervisor: Dr Connie Van
Project Summary: Community-acquired acute kidney injury (CA-AKI) is a frequent and severe adverse drug reaction (ADR) especially among older patients. Older patients are at a higher risk of AKI than younger patients, due to an increased prevalence of chronic kidney disease, cardiovascular morbidities, and polypharmacy. Drug involvement is estimated to be present in the occurrence of 20% to 66% of AKI cases. The honours project will retrospectively identify CA-AKI induced by drugs among older patients and explore the clinical characteristics of patients with CA-AKI induced by drugs and its risk factors to assess the prevention of AKI.
Techniques/Methods: Systematic review; data collection, analysis and interpretation; manuscript writing
Selected Publication: *Robert L et al Clinical Interventions in Aging 2019:14 2105–2113*

Project 2: Medication complexities and adherence in patients on dialysis and the impact on clinical outcomes

Co-Supervisors: Dr Connie Van, Dr Sophie Stocker
Project Summary: It is well recognised that patients on dialysis require complex medication regimens to manage multiple disease states. Once commenced on dialysis, the average number of medications is 10 to 12, with an average pill burden of 19 tablets/ day. While intended to be beneficial to the overall health of the patient, complicated medication regimens can lead to poor medication adherence and contribute to poor health outcomes. This retrospective study will explore the complexities of medication use in dialysis, impact on medication adherence and clinical outcomes in patients undergoing maintenance dialysis at Blacktown Hospital.
Techniques/Methods: Systematic review, data collection, analysis and interpretation, manuscript writing
Selected Publication: *Cardone K and Parker W. Seminars in Dialysis. 2020;33:449–456.*

Associate Professor Betty Chaar

My research is about ethical aspects of pharmacy practice. I have led teams to explore issues in many pharmacy pathways and services. From prescribing, vaccinations, abortion etc to euthanasia, there are always new and important issues to investigate and analyse to inform better practices and guidelines for pharmacists.
I would like to take the opportunity to explore pharmacists' experiences in the COVID-19 pandemic.

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Project 1: Exploring Ethical Dilemmas in Pharmacy Practice During Covid-19
Co-Supervisor: Professor Bandana Saini
Project Summary: This project will seek to explore Australian pharmacists' perspectives and experiences of ethical dilemmas in pharmacy practice during the Covid19 pandemic.
Pharmacists have been at the forefront of healthcare throughout the Covid19 pandemic and have played an enormous role in maintaining continuity of care for patients, sometimes under stressful conditions and shortages. Anecdotally we know that pharmacist have experienced ethical dilemmas, but to date there are no studies documenting this period and its impact on the profession of pharmacy in the future
Techniques/Methods: Qualitative study design – semi-structured interviews. Themes emerging will be reported and analysed for recommendations to be formulated.
Selected Publications:
Chaar, B., Brien, J., Krass, I. (2005) Professional Ethics in Pharmacy: The Australian Experience *International Journal of Pharmacy Practice* 2005, 13:195-204
Chaar, B. Kwong, K., Direct-to-Consumer Advertising: Australian Pharmacists' Experiences with Non-Prescription Medicines *International Journal of Pharmacy Practice* 2010; 18: 43-50.

Project 2: Exploring the role of pharmacists in the supply of Glucosamine- a Pseudo-patient study
Co-Supervisor: Dr Joanna Hartnett
Project Summary: There are many sources of literature that discuss recommendations about how HCPs should handle requests for herbal medicines or complementary/alternative medicines [CAMs]; e.g. for pharmacy there is a Position Statement by the Pharmaceutical Society of Australia that documents certain expectations of pharmacists regarding the supply of CAMS. It is of great importance that pharmacists upskill and address their professional responsibilities in relation to CAMs supply. However, it is not clear if or how any such recommendations have been adopted in the practice of pharmacy in the real world.
This "pseudo-patient" study will aim to seek a true image of what is happening in pharmacies in Australia regarding CAMs supply, with a specific focus on Glucosamine.
The method adopted will be the design of a brief checklist based on recommendations proposed by professional organisations such as PSA and any notable additions from ethicists in the field. The ground researcher will seek to purchase Glucosamine in randomly selected pharmacies around Sydney and use the check list to document the interaction with the pharmacist, if an interaction did occur.
Techniques/Methods: This 'pseudo-patient' study will involve the student act as if a patient and request glucosamine at several pharmacies, and immediately document every action taken in the context of this request against a standardised checklist, including an open-ended description of how the 'patient' felt. Data entered will be analysed both statistically and qualitatively.
Selected Publications:
Lee, K.A.; Harnett, J.E.; Ung, C.O.L.; **Chaar, B.** The provision of care provided by the pharmacy workforce in relation to complementary medicines. *RSAP* Aug 2020.
Lee, K.A.; Harnett, J.E.; Ung, C.O.L.; **Chaar, B**. Impact of Up-Scheduling Medicines on Pharmacy Personnel, Using Codeine as an Example, with Possible Adaption to Complementary Medicines: A Scoping Review. *Pharmacy* **2020**, *8*, 65.
Queddeng, K**. Chaar, B.** Williams, K* (2011) Emergency Contraception in Australian Community Pharmacies: a simulated patient study ***Contraception*** **83** (2011) 176-182.

Associate Professor Kellie Charles

I am passionate pharmacologist that is interested in improving medication safety and health outcomes for patients. My research aims to understand the roles that diverse health teams, and in particular pharmacy students and pharmacists, have in developing the formation of safe medication management teams and supporting the development of core prescribing competencies in medical students and junior doctors.

- **Contact**: kellie.charles@sydney.edu.au
- **Location**: Room 500, Badham Building

Project 1: The role of inter-professional teams in improving medication safety

Co-Supervisor: Dr Carl Schneider
Project Summary: Medication safety is a critical international and national health concern as evidenced by the WHO 3rd Patient Safety Call – Medications without harm and Australia's 10th National Health Priority. Inter-professional teamwork and communication is essential for the management of medications throughout the patient journey. Previous literature has shown that inter-professional teamwork has assisted medical students to develop new skills associated with prescribing. Using a mixed methods approach, this project will investigate the how, why and when does inter-professional teamwork improve medication safety within the earliest stages of prescribing competency development. The honours student will evaluate data from the 2021 implementation of the IPL Medication Safety Module and conduct further qualitative interviews with participants in 2022.
Techniques/Methods: This research project will involve a mixed-methods approach; quantitative analysis of changes in individual to team medication charts based on medication review and qualitative thematic analysis of in-depth interviews with students about their experience within the team-based medication review and planning. This study will most likely lead to a publication of this 2 year evaluation project.

Project 2: Rural versus city – A comparison of how inter-professional teams support the development of prescribing skills and medication safety

Co-Supervisors: Prof Sarah Hilmer, Prof Peter Carroll
Project Summary: Final year medical students and first year interns have frequently reported that they are unprepared for prescribing in real-world practice. This project will seek to explore the experiences and perspectives of medical interns at rural hospitals on how inter-professional team helps to develop confidence and competence of medication safety and prescribing skills. These experiences will be compared to those of interns from metropolitan hospitals. There are numerous studies that have shown the combination of intra-professional (from senior clinicians) and inter-professional formal and informal learning during the first year of internship is critical for the formation of safe prescribing confidence and competence. Many of the studies have been conducted in major, tertiary teaching hospitals that have access to higher ward-based pharmacists and other health professionals. It remains unclear how, where and through which mechanisms to rural junior doctors acquire these skills when there are lower ratios of pharmacy support. This project will inform the co-design of a larger research project on how to prepare medical and pharmacy students for rural practice.
Techniques/Methods: A mixed-methods approach will be used. Quantitative questionnaires and social network analysis + qualitative in-depth interviews, thematic analysis and realist evaluation.

Dr Janet Cheung

Dr Cheung is a registered pharmacist with a broad research interest in empowering patients to actively participate in their own health care. Her expertise in sleep research spans across the quality use of medicines in sleep, shared decision-making, and primary care health services.

- **Contact**: janet.cheung@sydney.edu.au
- **Location**: School of Pharmacy
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- **Research Group**: Group members include 1 Masters student, 1 PhD student and a multidisciplinary sleep research group at the Charles Perkins Centre.

Project 1: Caregiver knowledge and attitudes about circadian sleep health

Co-Supervisors: Dr Yu Sun Bin, Research Fellow, Sleep Research Group, Charles Perkins Centre, University of Sydney; Dr Prerna Varma, Research Fellow, Turner Institute for Brain and Mental Health, Monash University, Melbourne & Ms Samantha Lee, School of Pharmacy
Project Summary: The "naturalness" of melatonin is often conflated with its safety profile, leading to its widespread use in children with sleep disturbances. Despite caregivers being responsible for coordinating the care of their dependents, the extent to which their sleep promoting approaches align with the evidence base is unknown. In this project you will design a questionnaire to explore caregiver knowledge and attitudes about circadian sleep health. Findings will unveil potential knowledge gaps to help inform the development of education resources for caregivers.
Techniques/Methods: Cross-sectional survey and univariate analyses.
Selected Publication: Waldron, A. Y., Spark, M. J., & Dennis, C. M. (2016). The Use of Melatonin by Children: Parents' Perspectives. *Journal of Clinical Sleep Medicine, 12*(10), 1395-1401.

Project 2: A Snapshot of Pharmacists' Provision of Melatonin Use in Community Pharmacy

Co-Supervisors: Dr Yu Sun Bin, Research Fellow, Sleep Research Group, Charles Perkins Centre, University of Sydney; Ms Samantha Lee, School of Pharmacy
Project Summary: The recent down-scheduling of prolonged release melatonin as a schedule 3 product means that pharmacists are now directly involved in the counselling and provision of this product to patients over the age of 55. It is unclear how well pharmacists have responded to this recent practice change. As such, this project aims to understand pharmacists' current knowledge about sleep health, the circadian rhythm, and the use of melatonin. Through this project you will design a questionnaire to capture pharmacists' knowledge and attitudes towards the provision of melatonin use in community pharmacy. Findings can potentially shape future training and policies in practice.
Techniques/Methods: Cross-sectional survey and univariate analyses.
Selected Publication: Abraham, O., Schleiden, L. J., Brothers, A. L., & Albert, S. M. (2017). Managing sleep problems using non-prescription medications and the role of community pharmacists: older adults' perspectives. *International Journal of Pharmacy Practice, 25*(6), 438-446.

Dr Jack Collins

I am a pharmacy practice researcher at Sydney Pharmacy School and a practising community pharmacist. My research interests are in pharmacist care for people living with mental illness and consumer self-care. Currently, I am a postdoctoral researcher on the *Bridging the Gap Between Physical and Mental Illness in Community Pharmacy (PharMIbridge)* randomised controlled trial.

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Project: Schizophrenia Education in Healthcare Curricula

Co-Supervisors: Dr Sarira El-Den and Dr Claire O'Reilly

Project Summary: There is a need to strengthen healthcare professionals' willingness and ability to care for people living with mental illness, including schizophrenia. Common barriers that impede healthcare professionals' ability to provide quality care for this population include stigma and lack of confidence. This Honours Projects forms part of a larger multidisciplinary research project across the Faculty of Medicine and Health (Medicine, Nursing, Occupational Therapy, and Pharmacy). This larger project aims to design, deliver, and evaluate new schizophrenia educational materials for students in these disciplines with active involvement and contribution from consumers with lived experience of mental illness. Students will take part in role plays with trained actors to apply their skills and knowledge developed in Mental Health First Aid training.

In Semester 1, the Honours candidate will conduct a systematic review of relevant literature. In Semester 2, the candidate will undertake a research project which will evaluate the newly developed educational materials. The research project may lead to the implementation of a new, ongoing method of training future healthcare professionals in caring for people with mental illness with the involvement of lived experience educators.

Techniques/Methods: This project will involve a systematic literature review in Semester 1 and quantitative and/or qualitative data analysis methods in Semester 2.

Selected Publications:

- El-Den, S., Moles, R., Zhang, R., O'Reilly, C. (2021). Simulated Patient Role-Plays with Consumers with Lived Experience of Mental Illness Post-Mental Health First Aid Training: Interrater and Test Re-Test Reliability of an Observed Behavioral Assessment Rubric. *Pharmacy*, 9(1), 28.
- O'Reilly, C., Moles, R., Boukouvalas, E., El-Den, S. (2019). Assessing students' mental health crisis skills via consumers with lived experience: a qualitative evaluation. *The Journal of Mental Health, Training, Education and Practice*, 14(5), 361-371.

Dr Hien Duong

Our research is multidisciplinary which focuses on the new concepts and ideas to engineer novel materials and devices at nanoscale. The ultimate goal is to utilize the nanotechnology in the form of nanoparticles to extend our life in two ways: i) early detection of life-threatening diseases and ii) improvement of their current therapy. Our research area includes polymer synthesis, fabrication and characterization of organic, inorganic and biocompatible nanomaterials for biomedical applications.

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- **Research Group**: One PhD student, one MPhil student, one Honours student.

Project 1: Multimodal nanoparticles to overcome antibiotic resistance

Co-Supervisor: Dr Cindy Gunawan, the University of Technology Sydney
Project Summary: The rise of hospital-acquired infections, also known as nosocomial infections, is a growing concern in intensive healthcare, causing the death of hundreds of thousands of patients and costing billions of dollars worldwide every year. In addition, a decrease in the effectiveness of antibiotics caused by the emergence of drug resistance in pathogens living in biofilm communities poses a significant threat to our health system. We aim to develop a novel nanostructure-based formulation technology which can overcome antibiotic resistance and facilitate the wound healing in chronic infection. The novelty of this nanotechnology lies in the delivery of triple hits (bacteriophages, antibiotics and nitric oxide) to biofilm-related chronic infection. This formulation is expected to be much more effective than the conventional single-entity treatment. The ultimate goal is to develop a nanoformulation for chronic infection treatment.

Project 2: Peptide PEGylation for the optimal prostate cancer treatment outcome

Co-Supervisor: Dr Pegah Varamini
Project Summary: It has been demonstrated that secretory phospholipase A2-IIa (sPLA2-IIa) is overexpressed in almost all human prostate cancer, therefore this enzyme may potentially serve as a biomarker for prostate cancer (Dong et al, 2010). In our previous study, the pentapeptide, FLSYK (Phe-Leu-Ser-Tyr-Lys) dose-dependently inhibited the activity of human sPLA2-IIA. More importantly, an analogue of cyclic FLSYK (c2) recently entered clinical trials for the treatment of prostate cancer (Australian New Zealand Clinical Trials Registry, 2019). Although the FLSYK peptide and analogues have been consistently shown to be potent, its low aqueous solubility could hamper any clinical application. Therefore, the aim of this project is to enhance the solubility of these peptides in biological environment for the optimal prostate cancer treatment outcome. Our so-called PEGylation approach is to functionalise the peptides with a PEG-like polymer. This polymer greatly assists with colloidal stability (Duong, 2011). We will use two strategies for the conjugation: i) peptide will be permanently conjugated to the polymer and ii) peptide will be conjugated to the polymer through a pH-responsive linkage which will be cleaved in mildly acidic conditions at the tumour site. The solubility of the conjugate will be assessed in comparison with the intact peptides and the activity of the peptide conjugate will be evaluated using prostate cancer cells. The influence of conjugation strategies will also be investigated.
Project Techniques/Methods: Polymer synthesis and characterisation using advanced polymerization technique, nanoparticles preparation and characterization, microscopy techniques, biological testing.

Associate Professor Ingrid Gelissen

I am passionate about the role of nutrition in the development and management of chronic diseases, and have worked in this area from various perspectives, ranging from basic research to nutrition education, over the course of my career.

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- **Research Group**: In 2021 - 2 PhD students and 1 Honours student as primary supervisor; 1 PhD and 1 MPhil student as co-supervisor.

Project 1: Pharmacists' attitude towards counselling patients in general nutrition: evaluation of skills, confidence and need for training

Co-Supervisor: Dr Joanna Harnett

Project Summary: Community pharmacists are often considered the most accessible primary health care professionals. Pharmacists are expected to be knowledgeable about both pharmacological and non-pharmacological lifestyle interventions to prevent and manage a range of medical conditions.

Diet is one of the pillars of lifestyle interventions, and in combination with prescription medications is central to the clinical management of chronic diseases. Overseas studies have found that pharmacists feel they lack knowledge to effectively counsel their patients in general nutrition and diet related topics [1,2]. Our 2021 Honours project showed that final year pharmacy students and interns feel that providing dietary advice to patients is clearly part of their role, however their confidence on providing such advice is lacking. The aim of our study is to explore these findings further by conducting in-depth interviews with pharmacy interns and registered pharmacists to provide insights into what skills are lacking and how these can be improved in a practical and time-efficient manner. The results of this research will contribute to informing educational initiatives that aim to upskill pharmacists with the nutrition knowledge they need to care for people within the communities they practice.

Techniques/Methods: Qualitative research methods such as questionnaires and focus group interviews.

Selected Publication: [1] Douglas *et al* "Nutrition Education and Community Pharmacy: A First Exploration of Current Attitudes and Practices in Northern Ireland" *Pharmacy* 2019, 7, 27; doi:10.3390/pharmacy7010027 [2] Medhat et al "Knowledge, attitude and practice of community pharmacists towards nutrition counselling". *Int J Clin Pharm* 2019 doi.org/10.1007/s11096-020-01106-0. Picture from: www.heartfoundation.org.au.

Associate Professor Thomas Grewal

Our group is interested in cholesterol metabolism, and how cholesterol-lowering drugs impact on the progression of neurological disorders and other chronic diseases

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- **Location**: A15, Rm 512
- **Academic Profile**: https://sydney.edu.au/medicine-health/about/our-pe staff/thomas-grewal.html#collapseprofileteaching
- **Research Group**: 2 PhD students (Jaimy Jose, Mohamed Wahba), 1 Honours (Mai Khnah Linh Nguyen), 2 international MD students in 2022

Project: Statin use in Parkinson's Disease patients

Co-Supervisor: Professor Timothy Chen

Project Summary: Cholesterol is a unique molecule essential for cell integrity and critical for many physiological processes. In the brain, de-regulation of cholesterol homeostasis is linked to neurodegenerative diseases, including Parkinson's and Alzheimer's disease (PD, AD). In the elderly (>60 years), PD affects about 1% of the population and its prevalence increases with age. Moreover, accumulating evidence points at cholesterol metabolism contributing to PD pathogenesis. In particular, low levels of Low-density lipoproteins (LDL)-cholesterol is widely accepted as a risk factor for PD. While these findings are mostly based on retrospective studies, the use of statins, LDL-cholesterol-lowering drugs that reduce the risk of cardiovascular events, have shown therapeutic potential in PD. However, while observational studies associated statins with a 55% reduced risk for PD, several clinical trials rather indicated opposite and even harmful effects of statins in PD patients. Hence, more information on the statin type and dose, over time are needed to better correlate statin medication with PD severity. This proposal explores the relationship between cholesterol and statins in PD severity and progression. We propose to use the pharmaceutical collections databases from the Ministry of Health in New Zealand amongst other more specific databases. This pharmacoepidemiological study is an essential next step to identify the impact of cholesterol-lowering statins in PD progression, risk and prognosis.

Techniques/Methods: Supervisor A/Prof. T. Grewal has extensive knowledge on de-regulated cholesterol transport in neurodegenerative disorders (e.g. NPC disease (ref)) and most relevant for cholesterol-related aspects in PD. Prof Chen is a renowned researcher in the quality use of medicines and health services research. Dr Nishtala, is a leading and experienced pharmacoepidemiologist. This multidisciplinary team will allow the mapping of basic science findings to real world data. This project is an opportunity for students to develop skills on the analysis of epidemiological data sets related to neurodegenerative disorders and provides a unique opportunity to learn more about functioning of multidisciplinatory teams, in a global context, including Australia, UK and New Zealand.

Selected Publication:

Annexin A6 modulates TBC1D15/Rab7/StARD3 axis to control endosomal cholesterol export in NPC1 cells. Meneses-Salas E, … Grewal T, Enrich C, Rentero C.C ell Mol Life Sci. 2020 Jul;77(14):2839-2857.
Cholesterol Overload: Contact Sites to the Rescue! Enrich C, Rentero C, Grewal T, Futter CE, Eden ER. Contact (Thousand Oaks). 2019 Jan 1;2:2515256419893507.
Cholesterol Metabolism in Neurodegenerative Diseases: Molecular Mechanisms and Therapeutic Targets. Dai et al., Mol Neurobiol. 2021 May;58(5):2183-2201

Professor Paul W Groundwater

Paul's research interests include the design and synthesis of novel agents for the treatment of cancer and bacterial infections; the identification of the active principle of medicinal plants; and new methods for the detection of bacteria.

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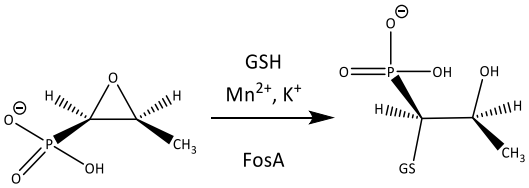
Project: Development of novel small molecule adjuvants designed to potentiate fosfomycin activity against multi-drug resistant Gram negative pathogens

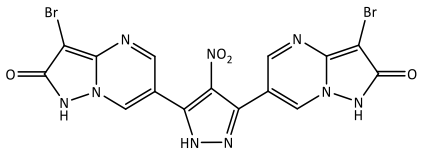
Co-Supervisors: Prof. Dai Hibbs, Dr Jonathan Du (Emory University, Georgia, USA)

Project Summary: Multidrug resistant (MDR) bacteria account for 15% of global hospital acquired infections, one of the leading causes of nosocomial mortality, and the six ESKAPE pathogens account for the majority of these infections.(Mulani et al., 2019) Carbapenemase producing ESKAPE MDR pathogens are on the WHO critical priority list. Developing novel antibacterial agents is not the sole solution to this urgent problem, as targeting the mechanisms that lead to resistance is a new approach to overcoming MDR. Combinations of antibacterials (the carbapenem □-lactams, *e.g.* meropenem) and agents which inhibit their degradation (□-lactamase inhibitors, *e.g.* vaborbactam) and thus overcome resistance, represent 40% of agents currently in clinical development.

The antibiotic fosfomycin (FOM) **1,** which was approved by the FDA for the treatment of urinary tract infections in 1996, has a broad spectrum of activity against both Gram positive and negative pathogens, good bioavailability, and very low toxicity. One of the main mechanisms for FOM resistance in Gram negative organisms such as the ESKAPE bacteria, *P. aeruginosa*, *K. pneumoniae* and *Enterobacter* spp., is enzymatic drug inactivation by FosA, **Scheme 1**.(Falagas et al., 2016) Our collaborators have shown that a novel competitive inhibitor of FosA, ANY1 **3**, potentiates the antibacterial activity of FOM in representative Gram negative pathogens.(Tomich et al., 2019)



1 **Scheme 1** **2 (inactive)**



3

Techniques/Methods: This project will utilize molecular modelling to identify other agents which inhibit FosA, and thus potentiate the antibacterial activity of FOM. It will also involve the synthesis and characterization of analogues of ANY1 **3**. Inhibitors identified by the modelling and / or synthesis will then be tested for FosA inhibition, and potentiation of FOM activity, by our collaborators at the Univ. of Pittsburgh and Emory University.

References: Falagas *et al*., 2016, *Clin Microbiol Rev,* vol. 29, no. 2, pp. 321-47; Mulani *et al*., 2019, *Front Microbiol,* vol. 10, pp. 539-539; Tomich *et al*., 2019, *Antimicrob Agents Chemother,* vol. 63, no. 3, pp. 14.

Dr Joanna Harnett

My research explores the appropriate and safe use of complementary Medicines (CM). Studies evaluate CM use in a range of populations, the quality of CM products, and their efficacy and safety. I am passionate about conducting research that can inform and resource health care professionals in adopting an evidence-based approach to advising people about the benefits and risks CM. One of my key areas of research explores the interface between CM and pharmacy practice.

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- **Location**: Room N347, Pharmacy Building A15
- **Academic Profile:** about/our-people/academic-staff/joanna-harnett.html
- **Research Group**: In 2021 - 3 PhD students (as principal supervisor); 2 Dalyell Scholar students (as principal supervisor); 3 PhD students (as associate supervisor); 2 Honours students (as co-supervisor),

Project: An evaluation of an educational program in complementary medicine for pharmacy
Co-Supervisors:
Prof. Parisa Aslani about/our-people/academic-staff/parisa-aslani.html
Prof. Lorraine Smith about/our-people/academic-staff/lorraine-smith.html

Project Summary: Over the last decade, studies evaluating pharmacists' role in providing advice about the appropriate and safe use of complementary medicines have repeatedly reported a need for non-biased evidence-based education within undergraduate and post-graduate pharmacy courses. In response to this need, the Sydney Pharmacy School developed a series of lectures and workshops to ensure pharmacy students received some training in CM. To date, the impact of this training on graduate's experiences, opinions, and confidence towards advising people about CMs has not been examined.
Therefore, the **aim** of this study is to explore the impact of an evidence-based CM program on graduates' experience, opinions and confidence towards providing CM advice. A systematic search and review of the literature reporting pharmacists' education in complementary medicines will be conducted and will inform the development of a semi-structured questionnaire for use during in-depth interviews and focus groups. The audio-recordings of the interviews and focus groups will be transcribed and a thematic analysis conducted. The **results** of this study will inform further improvements to CM content and delivery in pharmacy education.
Techniques/Methods: Qualitative design. The student will help with conducting interviews (telephone,
focus groups) and performing document and transcript analysis.
Selected Publication: Lee KA, Harnett JE, Ung CO, Chaar B. The provision of care provided by the pharmacy workforce in relation to complementary medicines in Australia. Research in Social and Administrative Pharmacy. 2021. 1;17(4):763-70.

Professor Jane Hanrahan

- **Contact**: jane.hanrahan@sydney.edu.au
- **Location**: Pharmacy Building A15
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Project: Evaluation of the effectiveness of hybrid compounding operations (non-closed system and closed system) in preventing surface contamination in an aseptic compounding unit and a chemotherapy day infusion unit
Partner: Chris O'Brien Lifehouse
Partner contact: Michael Soriano and Matt Roper
School mentors: Prof Jane Hanrahan, Dr Jennifer Ong, Prof David Hibbs

Project Description:
The use of closed system transfer devices (CTSD) in the compounding of cytotoxic infusions have been known to reduce surface contamination of these agents in cancer centres[1,2].
In 2020, the Chris O'Brien Lifehouse Day Therapy Unit switched from the ChemoClave Luer-based CSTD system to the ChemoLock Intuitive CSTD system. The Pharmacy Department however compounds our chemotherapy using cytotoxic drug safety cabinets (CDSD) with the aid of ChemoClave vial spikes for some of our products but revert to established safe handling techniques using needles when vial spikes are not suitable. In principle, the pharmacy department uses a semi-closed system for compounding while the Day Therapy unit uses a true closed system when administering chemotherapy.
For this study, we want to explore the effectiveness of our current compounding methods in preventing surface contamination during compounding and drug administration and identify any areas of opportunity to prevent staff exposure to cytotoxic agents.

Project aims
1. To assess if surface contamination occurs at the aseptic suite and the day therapy unit with our current compounding and administration methods.
2. To evaluate the efficacy of a true closed system, a semi-closed system and a non-closed system in preventing surface contamination in the pharmacy and day therapy unit.

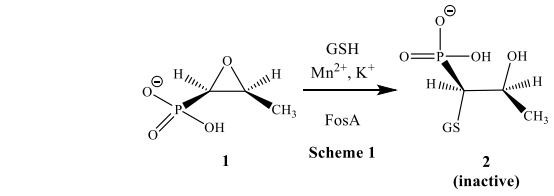
Professor David Hibbs

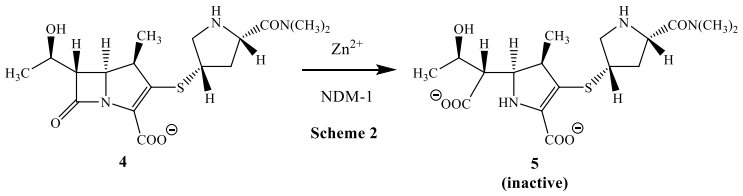
Computational Drug Design
High resolution X-ray and neutron diffraction

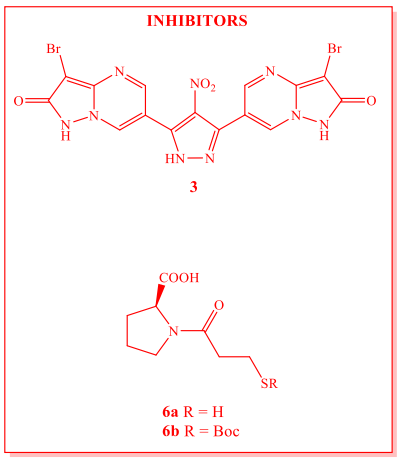
- **Contact**: david.hibbs@sydney.edu.au
- **Location**: Pharmacy
- **Academic Profile**: **Academic Profile**: https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/david-hibbs.html
- **Research Group**: Felcia Lai, Stephen Stanton, Bryson Hawkins, Patrick Chan

Project: Development of novel small molecule adjuvants designed to potentiate fosfomycin or meropenem activity against multi-drug resistant Gram negative pathogens

Co-Supervisors: Prof. Paul Groundwater, Dr Jonathan Du (Emory University, Georgia, USA)
Project Summary: Multidrug resistant (MDR) bacteria account for 15% of global hospital acquired infections, one of the leading causes of nosocomial mortality, and the six ESKAPE pathogens account for the majority of these infections.(Mulani et al., 2019) Carbapenemase producing ESKAPE MDR pathogens are on the WHO critical priority list. Developing novel antibacterial agents is not the sole solution to this urgent problem, as targeting the mechanisms that lead to resistance is a new approach to overcoming MDR.
Building upon our recent successes in the design and discovery of novel antibiotic adjuvants, this proposal addresses resistance in Gram negative bacteria through the potentiation of fosfomycin (FOM) 1 and the carbapenems, such as meropenem 4. These adjuvants inhibit enzymes responsible for the degradation of these antibiotics, Fosfomycin resistance protein A (FosA) and the New Delhi Metallo-b-lactamase (NDM-1), respectively, and thus provide alternative and innovative treatment options for nosocomial infections which are based upon agents already in clinical use.







In this novel approach, repurposed current therapeutics or **novel inhibitors which we have discovered**, such as ANY 1 **3** (a FosA inhibitor [**Scheme 1**]) and the prolines **6** (NDM-1 inhibitors [**Scheme 2**]), will be utilized to increase the sensitivity of the MDR Gram negative ESKAPE pathogens to FOM **1** or the carbapenems, *e.g.* **4**, respectively.
Techniques/Methods: This project will utilize molecular modelling to identify other agents which inhibit FosA or NDM-1. Inhibitors identified by the modelling and / or synthesis will then be tested for potentiation of FOM or meropenem activityactivity, by our collaborators at the Univ. of Pittsburgh and Emory University.
References: Falagas *et al*., 2016, *Clin Microbiol Rev,* vol. 29, no. 2, pp. 321-47; Mulani *et al*., 2019, *Front Microbiol,* vol. 10, pp. 539-539; Tomich *et al*., 2019, *Antimicrob Agents Chemother,* vol. 63, no. 3, pp. 14.

Professor Sarah Hilmer

Professor Sarah Hilmer is the Head of Department of Clinical Pharmacology and Senior Staff Specialist at the Royal North Shore Hospital. She is also a Conjoint Professor of Geriatric Pharmacology at the University of Sydney. Her team works on improving the safety and effectiveness of medicines for older adults. Professor Hilmer developed the internationally validated tool called the Drug Burden Index (DBI) which provides a score measuring a person's total exposure to anticholinergic and sedative medications.

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- **Location**: Kolling Institute, Royal North Shore Hospital
- **Academic Profile**: https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/sarah-hilmer.html
- **Research Group**: 5 postdoctoral research fellows, 5 PhD students and 1 research manager

Project: Evaluation of patient experiences of medication management following integration of the Drug Burden Index in Electronic Medical Records

Co-Supervisors: Dr Nashwa Masnoon, Dr Edwin Tan, Ms Sarita Lo
Project Summary: The Drug Burden Index (DBI), a measure of a person's total exposure to anticholinergic and sedative medications, is often associated with adverse health outcomes such as delirium and falls. An intervention bundle, including the DBI tool integrated in electronic Medical Records (eMR), is being trialled in older inpatients to facilitate deprescribing of sedative and anticholinergic medications. This Honours project aims to assess the patient experience of medication management following integration of the DBI tool in the eMR.

The following assessments may be used after discharge to evaluate patient experiences of medication management:

- NSW Therapeutic Advisory Group Patient Reported Experience Measures
- Goals of care assessments
- EQ-5D (standardised measure of health related quality of life)
- Barriers and enablers to uptake of the intervention bundle

There may be the opportunity for the student to recruit participants in person on the hospital wards.
Techniques/Methods: systematic literature review, qualitative and quantitative data collection, analysis and interpretation, manuscript writing.

References:
1. NSW Therapeutic Advisory Group. Resource Kit for Measuring Strategies to Reduce Harm from Polypharmacy in Australian Hospitals: QUM Indicators, Patient Reported Experience Measures and Risk Stratification Tools. NSW TAG Nov 2020.
2. Wu H, Kouladjian O'Donnell L, Fujita K, Masnoon N, Hilmer SN. Deprescribing in the Older Patient: A Narrative Review of Challenges and Solutions. Int J Gen Med. 2021;14:3793-807.

Dr Lifeng Kang

Dr Kang's research is in the field of the microscale technologies and 3D printing in drug delivery and tissue engineering. For drug delivery, microstructures can be engineered to deliver drugs (e.g., microneedles). For tissue engineering, they can be used to fabricate biomimetic scaffolds to regenerate tissues and organs.

- **Contact**: lifeng.kang@sydney.edu.au
- **Location**: Building A15, Room S244
- **Academic Profile**: kanglab.net
- **Research Group**: Currently 1 MPhil and 1 PhD students

Project 1: The personalised polypill: 3D printing to simplify medication taking in older people

Co-Supervisor: Dr. Edwin Tan (Sydney Pharmacy School)
Project Summary: Over 40% of people aged 65 years and older use five or more medications. Clinically appropriate polypharmacy, although necessary to manage multimorbidity, may contribute to low adherence, pill burden, inaccurate dosing and medication errors. This is particularly problematic in vulnerable patient groups such as those with cognitive impairment and dementia. 3D printing can be used to combine complex medication regimens into a single personalized pill. This can allow for tailoring of drug combinations, doses and release profiles to suit patient needs, thus improving patient adherence, tolerability and health outcomes. We propose to investigate the feasibility of a personalized polypill using 3D printing technology. Upon completion of this project, we will have a prototype 3D Rx printer to be used in pharmacies to make personalised polypills.
Techniques/Methods: To use a 3D printer to fabricate tablets to deliver multiple drugs and characterize the tablets in a wet lab in Sydney Pharmacy School.
Selected Publication: Lim SH, Chia SMY, Kang L, Yap KYL. 2016. Three-dimensional-printing of carbamazepine sustained-release scaffold. Journal of Pharmaceutical Sciences. 105(7):2155-63.

Project 2: A 3D printed human lung model for microparticle characterisation and optimisation

Co-Supervisor: Dr. Philip Kwok (Sydney Pharmacy School)
Project Summary: Inhalation is the main route of drug delivery for asthmatic and chronic obstructive pulmonary disease patients and offers several advantages over the oral route. Determining the amount of drug deposited in various parts of our respiratory tract allows for a good correlation to clinical efficacy of inhalation drug devices. However, the aerodynamic particle size distribution measured by cascade impaction with the pharmacopeial throat does not truly represent the *in vivo* deposition in the human respiratory tract and provides no accurate *in vivo* predictions. To establish a reliable *in vitro* model, the major challenge is the complex structure of the upper respiratory tract. To address this challenge, three-dimensional printing (3DP) can be used. 3DP can accommodate various geometrical outlines and can construction materials. In this project, we aim to build a human airway model by using 3DP. With this model, particulate drug delivery systems will be tested *in vitro*.
Techniques/Methods: To use a 3D printer to fabricate a model using elastomers to replicate an adult upper respiratory tract with complex anatomical structures and suitable elasticity for drug deposition testing.
Selected Publication: Chen G, Xu Y, Kwok PCL, Kang L. 2020. Pharmaceutical applications of 3D printing. Additive Manufacturing. 34:101209. DOI: 10.1016/j.addma.2020.101209
Lim SH, Park S, Lee CC, Ho PCL, Kwok PCL, Kang L. Feb 2021. A 3D printed human upper respiratory tract model for particulate deposition profiling. International Journal of Pharmaceutics. 597, 120307. DOI: 10.1016/j.ijpharm.2021.120307.

Associate Professor Veysel Kayser

My research interests centre around developing new biologics such as mAbs and vaccines, their formulations, and novel methods to address a range of challenges associated with the development of biologics.

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- **Location**: A15 (S206)
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- **Research Group**: We have 5 PhD and 1 Honours student

Project 1: New Formulations for Biologics

Co-Supervisor: A/Prof. Serdar Kuyucak (Physics)
Project Summary: Protein aggregation is a major hurdle when developing biologics such as monoclonal antibodies (mAbs) and vaccines. Previously, we developed new formulation strategies to overcome protein aggregation problem (1, 2). In this project, we will prepare novel mAb formulations and multi-valent influenza vaccine formulations using our new approaches such as ionic liquids and other additives. The study will focus on detecting protein aggregates and split virus induced by heat and/or surfactants in the presence of ionic liquids using various biophysical methods such as fluorescence spectroscopy. Mainly, external dye-binding method using a hydrophobic dye will be utilized to probe molecular interactions (3).
Techniques/Methods: The student will mainly use UV-Vis and fluorescence spectroscopy methods, but s/he will have an opportunity to work closely with other group members and learn about other methods.

Project 2: Predictive and Screening Methods for the Development of Biologics

Co-Supervisor: A/Prof. Serdar Kuyucak (Physics)
Project Summary: Therapeutic proteins such as mAbs and vaccines degrade over time mainly due to protein aggregation, making their development, manufacturing and long-term storage difficult. Previously, we developed various predictive methods for candidate and formulation screening, and long-term stability estimation of mAbs and influenza vaccines (3-5). In this project, we will develop similar predictive and screening methods that can be used for formulation screening and/or comparison of biosimilars and vaccines. The focus will be detecting small differences, e.g., protein aggregation propensity, between different formulations that are highly similar. External dye-binding method using a hydrophobic dye will be utilized to probe molecular interactions (3,5).
Techniques/Methods: The student will mainly use UV-Vis and fluorescence spectroscopy methods, but s/he will have an opportunity to work closely with other group members and learn about other methods.

Selected Publication: **(1)** Z. Elgundi *et al.* (2017). The state-of-play and future of antibody therapeutics. *Adv Drug Deliv Rev*, 122, 2-19. **(2)** M. Reslan *et al.* (2018). Choline ionic liquid enhances the stability of Herceptin® (trastuzumab). *Chem Comm*, 54(75), 10622-10625. **(3)** Z. Sahin *et al.* (2017). Nile red fluorescence spectrum decomposition enables rapid screening of large protein aggregates in complex biopharmaceutical formulations like influenza vaccines. *Vaccine*, 35(23), 3026. **(4)** V. Kayser *et al.* (2011). Choline ionic liquid enhances the stability of Herceptin® (trastuzumab). *J Pharm Sci,* 100(7), 2526-2542. **(5)** V. Kayser *et al.* (2012). A screening tool for therapeutic monoclonal antibodies: Identifying the most stable protein and its best formulation based on thioflavin T binding. *Biotech J*, 7(1), 127-132.

Dr Philip Kwok

My research interests include
- Respiratory drug delivery
- Particle engineering
- Physicochemical characterisation of powders
- Electrostatics of aerosols for inhalation

- **Contact**: philip.kwok@sydney.edu.au
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- **Research Group**: 3 PhD, 1 MPhil, and 2 Honours students

Project: Inhalable powders for enhancing the delivery of cannabinoids

Co-Supervisor: Prof Hak-Kim Chan, A/Prof Jonathon Arnold

Project Summary: Cannabinoids have a variety of pharmacological actions but they have low aqueous solubility and low oral bioavailability, which pose challenges to their delivery. Inhalation is an alternative route of administration with higher bioavailability for these compounds. This project aims to develop and characterise inhalable cannabinoid formulations with enhanced solubility. It involves particle production, dissolution tests, and aerosol performance evaluation. Powders with good physicochemical and aerosolisation properties may potentially be tested *in vivo* in the future.

Techniques/Methods: Spray drying/spray freeze drying, high performance liquid chromatography, and cascade impaction

Selected Publications:

1. Tai W, Anderson LL, Arnold JC, Chan H-K, Kwok PCL (In Press) Inhalable cannabidiol dry powders with enhanced solubility. *Drug Delivery to the Lungs 2021 Conference Papers*. (Available upon request)
2. Devinsky O, Kraft K, Rusch L, Fein M, Leone-Bay A (In Press) Improved bioavailability with dry powder cannabidiol inhalation: A Phase 1 clinical study. *Journal of Pharmaceutical Sciences*. (https://doi.org/10.1016/j.xphs.2021.08.012)

Professor Chung-Wei Christine Lin

My research is focused on investigating the benefits and harms of treatments for musculoskeletal conditions. I have shown that some common medicines are not effective and may cause more harms in people with back pain, leading to changes in clinical guidelines and practice. I also lead research to investigate ways to reduce the use of opioid medicines for non-cancer pain.

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- **Location**: Level 10N KGV Building, Missenden Road, Camperdown
- **Academic Profile**: https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/christine-lin.html#collapseprofileresearchinterest
- **Research Group**: Sydney Musculoskeletal Health, a partnership of North Sydney Local Health District, Sydney Local Health District, and the University of Sydney. We are a multidisciplinary team comprising of physiotherapy, orthopaedic, rheumatology, and pharmacy researchers with aims to manage and cure musculoskeletal conditions, promote healthy ageing and physical activity.

Project: Investigating the safety and efficacy of opioid analgesics

Co-Supervisors: A/Prof Danijela Gnjidic, Dr Carl Schneider and Ms Caitlin Jones
Project Summary: People who undergo surgery are often administered an opioid analgesic immediately after surgery for pain management. Given the known harms of opioids (e.g. nausea, vomiting, headache, dizziness, somnolence, constipation, risk of long-term use and harm from misuse) it is important that opioid analgesics are only prescribed when the benefits outweigh the harms. There are concerns that opioids are being overprescribed to patients after surgery. This project will investigate the benefits and harms of opioid analgesics administered to people in the immediate post-operative phase after a surgical procedure and provide evidence to guide practice.

Techniques/Methods: Systematic review with meta-analysis. As an honours student you will be involved in developing the protocol which will be prospectively registered. You will be guided through conducting a systematic search of multiple databases, conducting screening, data extraction, performing risk of bias assessments, and conducting quantitatively analysis where possible.

Selected Publication:
Ferreira GE, McLachlan AJ, Lin C-WC, et al (2021). Efficacy and safety of antidepressants for the treatment of back pain and osteoarthritis: systematic review and meta-analysis. BMJ 372: m4825.
Mathieson S, Maher CG, Ferreira GE, et all (2020) Deprescribing opioids in chronic non-cancer pain; systematic review of randomised trials. Drugs 80: 1563-1576.
Enke O, New HA, New CH, et all (2018) Anticonvulsants in the treatment of low back pain and lumbar radicular pain: A systematic review and meta-analysis. CMAJ 190: E786-793.

Associate Professor Barbara Mintzes

The main focus of my research is on pharmaceutical policy, including how the policy environment affects the quality, effectiveness and safety of medicine use and ultimately patients' health. This includes examining the role of commercial influences on medicine use. I also carry out systematic reviews of outcomes of drug treatments, including both benefits and harm.

- **Contact**: Barbara.mintzes@sydney.edu.au
- **Location**: Charles Perkins Centre
- **Academic Profile**: https://www.sydney.edu.au/medicine-health/about/our-people/academicstaff/barbara-mintzes.html
- **Research Group**: Evidence Policy and Influence Collaborative (EPIC) at the Charles Perkins Centre

Project 1: Media Coverage of Harms of COVID-19 Vaccines: a comparative analysis

Co-Supervisor: Prof Janice Graham, Dalhousie University
Project Summary: The aim of this project is to examine how rare, serious risks of COVID-19 vaccines were portrayed to the public in the media during 2021 in Australia and Canada, and also how this portrayal shifted over time over the course of the year, both as more evidence became available on vaccine risks and benefits and as supply and availability of alternatives shifted. The comparison of Australia and Canada reflects roughly similar health systems, federal/state/provincial co-management of health services, and a public health imperative in both countries for high vaccination coverage to combat the pandemic. In the short-term, however, regulatory approach and vaccine availability differed.
Techniques/Methods: This project includes a systematic literature search in a media database (Factiva or Lexis-Nexis), development and application of a coding framework for how information is presented, and a content analysis. The lit review will be on risk communication to the public on medicines.
Selected Publication: Fabbri A et al. Media coverage of drug regulatory agencies' safety advisories: a case study of citalopram and denosumab. Br J Clin Pharmacol 2020; 86:1416-1429.

Project 2: Pharmaceutical Industry Funding of Health Consumer Organisations in Australia: does funding status predict policy recommendations?

Co-Supervisor: Dr Lisa Parker
Project Summary: Health consumer organisations (HCOs) are non-profit groups that represent the interests and views of patients and consumers of healthcare and play an influential role in healthcare policy. They often require external funding and increasingly rely on pharmaceutical industry sponsors. Member companies of Medicines Australia must publish all payments to HCOs. We have just updated a research database to include payments from 2017-2020 inclusive. This project includes a descriptive overview as well as an analysis of policies versus funding status for a sample of funded and unfunded HCOs. The aim is to better understand how industry sponsorship affects patient and public representation.
Techniques/Methods: Descriptive statistical analysis, systematic data coding and content analysis.
Selected Publication: Fabbri et al. , Industry funding of patient and health consumer groups. Systematic review with meta-analysis. BMJ. 2020; 368:16925

Dr Stephanie Mathieson and Professor Andrew McLachlan

Research Group Focus: Understanding optimal pain management strategies and reducing inappropriate medicine prescribing and use, with a particular focus on opioid analgesics and gabapentinoid medicines.

Dr Stephanie Mathieson **(E:** stephanie.mathieson@sydney.edu.au**)**
NHMRC Health Professional Research Early Career Fellow, School of Public Health
Contact: +61 2 8627 6256
Location: Rm 59, Level 10 North, KGV Building, RPA Hospital, Camperdown
Research Group: Pharmacy HDR students and an extensive network of students at the Institute of Musculoskeletal Health.

Project 1: Effectiveness of deprescribing interventions for gabapentinoids when used for pain: a systematic review

Co-Supervisors: Dr Christina Abdel Shaheed, Professor Andrew McLachlan
Project Summary: Gabapentinoids (pregabalin and gabapentin) are indicated to treat neuropathic pain in adults and epilepsy. However, they are increasingly prescribed to treat other pain conditions (i.e. “off label” prescribing). The increasing number of associated harms, including deaths reported, is a public health concern. When these medicines have been prescribed and the benefits do not outweigh the harms, the medicine should be deprescribed. However, there is no consensus nor a clinical guideline on safe and effective ways to deprescribe gabapentinoids. To our knowledge, a systematic review of clinical trials assessing gabapentinoid deprescribing interventions has not been previously conducted nor registered. Therefore, this review aims to evaluate the efficiency of interventions designed to reduce/cease the prescription of, or the use of gabapentinoids when used for pain.
Techniques/Methods: Systematic review and meta-analysis methodology
Selected Publications:
1. Mathieson S, Maher CG, McLachlan AJ, et al. Trial of pregabalin for acute and chronic sciatica. *N Engl J Med*. 2017;376(12):1111-20.
2. Mathieson S, Maher CG, Ferreira GE, Hamilton M, Jansen J, McLachlan AJ, et al. Deprescribing opioids in chronic non-cancer pain: systematic review of randomised trials. *Drugs*. 2020;80(15):1563-76.

Project 2: The development of clinical deprescribing materials

Co-Supervisors: Dr Christina Abdel Shaheed, Professor Andrew McLachlan
Project Summary: Following the evidence found in the systematic review above (Project 1), clinical materials will be developed to aid clinicians in successfully deprescribing gabapentinoids. Evidence-based clinician and patient-specific resources will be developed. A clinician-specific resource will include information about at-risk patient groups and tapering and symptom management strategies. A patient-specific resource to be used by the clinician in conjunction with the patient will include a template for an individualised tapering plan, strategies to manage withdrawal symptoms, a pain management plan etc. An additional information sheet will be developed for patients to “take-home” providing information on gabapentinoid harms, reassurance, frequently asked questions, etc. Consumer feedback will be sought on the materials.
Techniques/Methods: content development and analysis, including qualitative analysis of consumer perspectives.
Selected Publication: Mathieson S, Lin C-WC, Underwood M, Eldabe S. Pregabalin and gabapentin for pain. *BMJ*. 2020;369:m1315.

Dr Slade Matthews

Toxicology information is traditionally gathered using animal studies. These experiments are forbidden in cosmetic safety assessment in Australia and other developed nations creating an imperative to employ other toxicological assessment techniques. Computational toxicology is already being used in pharmaceutical development and by governmental regulators. In our lab we are developing real-world technologies for toxicological assessment in collaboration with Australian Federal regulators.

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- **Research Group**: Computational Pharmacology & Toxicology Laboratory

Project: Application of Bayes Theorem to Machine Learning Ames Mutagen Classifiers
Co-Supervisor: Associate Professor Helen Ritchie
Project Summary: Detection of potential mutagens using computational toxicology techniques is important for public safety in both the chemical regulation and drug development fields. The most widely used in vitro test for mutagenicity in both areas is the Ames test but it is both expensive and time consuming. In Australia there are many thousands of chemicals on the Australia chemical register for which the toxicological profile has never been characterized and the cost of testing them in vitro simply prohibits this. Thus, necessitating the use of computational approaches that can answer toxicological questions both quickly and cheaply. Several computational models of Ames mutagenicity have been developed but room for improvement exists particularly in the area of weight of evidence approaches to classification. Recently a first Bayesian approach paper in this area was published[1] and this project will build on the concept to develop of more systematic and cheminformatics based approach to application of Bayesian probability to Ames chemical mutagenicity prediction in diverse chemical datasets. The aim of this project is to answer the question "Would incorporation of a Bayesian approach to mutagen prediction through cheminformatic grouping of chemicals into chemically selfsimilar groupings yield an index of predictive confidence that correlates with ground-state outomces and hence provide a weight of evidence value for Ames mutagenicity predictions?" A sub-question is "What is the most effective similarity index method for chemical grouping in Ames prediction" (this is a question of intense interest to regulators at the present time).

Techniques/Methods: The tools for this project are Python packages for data science including Scikitlearn, Pandas, RDkit/Mordred and publicly available databases such as the OECD QSAR Toolbox and published databases from Hansen, Benigni, Tinto-Moliner. Databases must be gathered and curated and turned into a canonical SMILES list before being analysed with Mordred to generate chemical information in a two-dimensional grid. This will be analysed with RDkit to generate indices of chemical.

Associate Professor Rebekah Moles

Rebekah Moles is passionate about improving the way medicines are used, to ensure medication safety. Because of this, Rebekah has worked with a team of pharmacists, medical practitioners, nurses and engineers to invent SetDose – A smart syringe system to eliminate liquid dose errors. This device is a patented medical device that attaches to standard syringes, where doses can be set to avoid measurement errors. The product is ready to undergo further testing under trial conditions with caregivers in a simulated dosing experiment.

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- **Academic Profile**: Associate Professor Rebekah Moles (sydney.edu.au)
- **Research Group**: Pharmacy practice

Project: A randomised cross-over comparison trial of SetDose against standard technique – A simulated dose study

Co-Supervisor/Collaborators: The SetDose team (Carl Schneider, Timothy Chen, Andrew McLachlan, Jennifer Fraser, Lyndal Trevena, Henry Please, Seamus Thompson, Philip Boughton)
Project Summary: Two out of three parents make errors with common over the counter liquid medicines. (See refernces below). SetDose is a patented smart syringe system designed to assist caregivers administer liquid medicines accurately. SetDose consists of a mechanical device that can attach to standard syringes. The device accepts a pre-coded card that can control dose volumes. Prototypes have been designed and undergone preliminary accuracy testing and preliminary rounds of user testing with excellent accuracy and positive feedback. Mature embodiment of the prototype via industrial design will be completed by the end of 2021 resulting in 10 prototypes ready for trial. The main aim of this project is to trial this new prototype with users.
Techniques/Methods: The first experiment will involve using SetDose attached to a syringe versus other standard measuring techniques such as syringes, measuring cups and droppers to ensure the accuracy of each of the 10 prototypes. This will involve the student making various measurements of different volumes to ensure prototype accuracy and functionality. The next phase will involve a cross over randomized comparative trial with caregivers. In this trial phase we will be using the 10 mature embodiment prototypes in the randomized cross over design trial followed by qualitative interviews and the administration of the Van Westerndorp wiliness to pay questionnaire. A sample of 100 caregivers will be recruited and undertake a dosing the simulation scenarios. In these scenarios, caregivers will be randomized to either use the SetDose device or to use their normal dosing technique to assist them measure a common over the counter liquid medicine for "their child" (Note, children will not be present however the scenario requires them to simulate their actions during this scenario). The accuracy of their liquid measurement skills will be compared, by weighing the content of liquids administered. Participants will then be asked to repeat the task after swapping groups, that is those that used SetDose will now be asked to use their standard technique and those that used their standard technique will then use the SetDose device. A comparison of accuracy measurements will then be undertaken and analyzed. Following the experiment caregivers will be interviewed to gather their feedback on the useability and acceptability of the device, as well as asked about their wiliness to pay for such a device using the VanWesterndorp pricing method. Interviews will be transcribed verbatim, and pricing will be plotted.
Selected Publication:
SO168_Heitbrink manuscript.pdf - Google Drive
Management of children's fever by parents and caregivers: Practical measurement of functional health literacy - PubMed (nih.gov)
SetDose - a smart syringe system (sydney.edu.au)
(60) SetDose Team Video - YouTube

Dr Lisa Kouladjian O'Donnell

I am a Research Fellow in Geriatric Pharmacotherapy at the Sydney Medical School (Northern) and Clinical Pharmacist Educator Sydney Pharmacy School. I'm also a registered consultant pharmacist. My research interests surround the development and implementation of strategies to improve medication management in older adults, especially those living with dementia. I've developed tools such as The Drug Burden Index Calculator© and the Goal-directed Medication review Electronic Decision Support System (G-MEDSS)© - key examples of translation from research into practice.

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- **Research Group**: Our research group includes post-doctoral pharmacists, clinicians, PhD and honours students, and research assistants, and is based at the Clinical Pharmacology and Aged Care Laboratory.

Project 1: Medication-related goals of care in older adults with dementia
Co-Supervisors: Professor Parisa Aslani, Professor Sarah Hilmer
Project Summary: Polypharmacy is common in older adults, especially those living with dementia, and is linked with medication-related adverse events, such as hospitalisation. Emerging evidence suggests that aligning deprescribing with a patient's goals of care can be an effective strategy for reducing polypharmacy, as medication-related goals of care can empower individuals to safely self-manage through effective prioritisation and communication of care activities. However, little is known about the types of goals that older people living with dementia, and their carers, have for their medications and their health. The aim of this study is to identify the goals of care that older people living with dementia have about their medications and the connection of those goals to their overall health. This review will give insight into the goals and preferences of older people with dementia and inform the development of patient-centred tools to guide medication self-management in older people with dementia.
Techniques/Methods: Systematic Review Methodology. **Selected Publication:** Sawan M, Kouladjian O'Donnell L, Hilmer SN. Perspectives of residential aged care facilities' staff on the identification and recording of residents' medication-related goals of care. Australasian J Ageing 2020;39(1):e134-e144.

Project 2: The burden of anticholinergic inhalers in older adults
Co-Supervisors: A/Prof Danijela Gnjidic, Professor Sarah Hilmer, Professor Sinthia Bosnic-Anticevich, Dr John Mach
Project Summary: Older people present considerable variability in the responses to medicines, as they have altered pharmacokinetics and pharmacodynamics. Anticholinergic burden from orally administered medications in older adults is well established, however the systemic effects of inhaled anticholinergic medications, especially in those with polypharmacy and multimorbidity, have not been extensively investigated. The aim of this study is to establish the evidence surrounding the risk of burden from inhaled anticholinergic medications in older adults. This review will determine the types of systemic effects (peripheral and central) reported in the literature (published and grey literature), and the potential impact of anticholinergic inhalers in older adults with polypharmacy and multimorbidity.
Techniques/Methods: Systematic Review Methodology, preclinical toxicology, pharmacokinetic and drug interaction studies. **Selected Publication:** Stephenson A et al. Inhaled Anticholinergic Drug Therapy and the Risk of Acute Urinary Retention in Chronic Obstructive Pulmonary Disease. Arch Intern Med. 2011;171(10):914-920.

Dr Jennifer Ong

Jennifer is interested in promoting quality of life palliative care settings And at end-of-life through the judicious use of medications. This includes anticipatory prescribing as well as minimising non-beneficial treatments.

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Project: Medicinal cannabis use an oncology setting: A retrospective analysis of patient compliance and opportunities for pharmacist to optimise therapy

Co-Supervisors: Jeffery Li, Janet Gaon, Hala Musa, Associate Professor Judith Lacey, Prof David Hibbs

At Chris O'Brien Lifehouse (COBLH), the use of medicinal cannabis (MC) is utilised to manage a host of cancer symptoms such as chemotherapy-induced nausea and vomiting, cancer pain management, loss of appetite and sleep disorder which is supported by the most recent review from the USA National Academies of Sciences, Engineering, and Medicine [1]. To date, our hospital uses oral formulation including capsules and oil containing cannabidiol (CBD), delta-9-tetrahydrocannabinol (THC) and a variety of terpene profiles, however there is still uncertainty about the optimal THC/CBD ratios, dosing, route of administration, and often involves self-titration by the patient.

People with chronic pain have shown preference for balanced ratios of THC and CBD or higher levels of CBD, which is relatively less psychoactive compared to THC. Whilst social factors have the potential to influence patient compliance with MC positively (including support from friends and family) and negatively (such as stigma), the fear of addiction, losing control and acting strangely have also been identified as concerns and patients do want to learn more about MC from HCPs [2,3].

We aim to conduct a retrospective analysis to investigate patient compliance and experience with MC to identify opportunities where the pharmacist can bridge information gaps between physicians and patients. The findings from this project will provide insights into MC adoption, further forming the foundation for a pharmacist education program.

References:

[1]. National Academies of Sciences E, Medicine. The health effects of cannabis and cannabinoids: the current state of evidence and recommendations for research. 2017.
[2]. Zeng L, Lytvyn L, Wang X, et al. Values and preferences towards medical cannabis among people living with chronic pain: a mixed-methods systematic review. *BMJ Open*. 2021; **11**: e050831.
[3]. Matson TE, Bradley KA, Lapham GT. Self-reported Practices of Frontline Cannabis Dispensary Workers and the Implications for Clinicians. *JAMA Network Open*. 2021; **4**: e2125262-e2125262.

Professor Sid Patanwala

My research pertains to the comparative effectiveness and safety of medications in the critically ill. This includes the therapeutics of medications used in the real-world setting and their effect on patient outcomes. Projects usually involve patients in the intensive care units or emergency departments.

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- **Research Group**: Pharmacists and physicians at RPAH/USYD

Project: Transdermal buprenorphine for acute pain

Co-Supervisor: Dr. Jonathan Penm (collaborators: Dr. Heike Koelzow - Intensive Care Specialist, Dr. Charlotte Johnstone - Pain Medicine Specialist and Anaesthetist, Dr. Benjamin Moran - Intensive Care Specialist)
Project Summary: Buprenorphine is a partial mu-opioid receptor agonist and a kappa receptor antagonist.[3] The transdermal formulation is indicated for severe pain, in settings when daily, continuous, long-term therapy is needed, and other options are not suitable.[4] At the Royal Prince Alfred Hospital (RPAH), transdermal buprenorphine is initiated for some patients in the ICU. The rationale for this use is to provide a continuous form of analgesia in those who are expected to have severe and sustained pain during hospitalization. It is also theorized to mitigate the development of hyperalgesia.[5] However, the effectiveness and safety of this approach in the ICU is unknown. In this project, a systematic review will be conducted pertaining to this topic. Data will be extracted from existing literature to perform a meta-analysis. This is a literature-based project. The student may be able to attend clinical rounds at RPAH to understand pain management in the ICU and post-operative settings as part of the project.
Techniques/Methods: systematic review, meta-analysis using RevMan
Selected Publication: Pergolizzi JV Jr, Magnusson P, LeQuang JA, Breve F, Mitchell K, Chopra M,
Varrassi G. Transdermal Buprenorphine for Acute Pain in the Clinical Setting: A Narrative Review. J Pain Res. 2021;14:871-879. https://pubmed.ncbi.nlm.nih.gov/33833565/

Dr Jonathan Penm

Dr Penm's research focuses on improving hospital pharmacy services and the use of high-risk medicines, such as opioid medications and antimicrobials, in the hospital setting. Dr Penm is interested in health service research that focuses on developing and implementing evidence informed strategies and system level-interventions (e.g. education, policy, technology) to improve the use of medicines and minimise medication-related harms.

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- **Research Group**: 1 Honours student, 3 PhD students, pharmacists, physiotherapists, nurses and physicians at Prince of Wales, Sutherland and Fairfield Hospital

Project 1: Clinician perceptions of opioid weaning before hip and knee replacement surgery

Co-Supervisor: Prof Asad (Sid) Patanwala, Dr Justine Naylor (Physiotherapist, Fairfield Hospital)
Project Summary: Regular opioid use in patients before hip or knee replacement surgery is associated with greater opioid doses, duration, worsened postoperative pain and surgical outcomes. Nguyen et al. (2016) provide preliminary evidence that reducing these patients' opioid use before surgery improves post-surgical outcomes similar to opioid naïve patients.[1] This research involves qualitative one-on-one semi-structured interviews with pharmacists, doctors and nurses on the implementation of opioid weaning before surgery.
Techniques/Methods: Qualitative interviews (Telephone or Zoom). NVivo to assist with thematic analysis.
Selected Publication:
1. Nguyen L, Sing D, and Bozic K. Preoperative reduction of opioid use before total joint arthroplasty. J Arthroplasty 2016. 31(9): 282-287.

Project 2: Doctors' perceptions of the amount of opioids supplied after surgery on discharge

Co-Supervisor: Prof Asad (Sid) Patanwala
Project Summary: Opioid analgesics are often prescribed on hospital discharge after surgery to manage moderate to severe acute pain. However, a systematic review should that up to 71% of dispensed opioids go unused. This excessive opioid prescribing on discharge may contribute towards an opioid reservoir in the community and pose a health risk due to potential for diversion, misuse or overdose. This research involves qualitative one-on-one semi-structured interviews with hospital doctors and surgeons on the appropriate amount of opioids to be supplied after surgery and barriers to implementing this process.
Techniques/Methods: Qualitative interviews (Telephone or Zoom). NVivo to assist with thematic analysis.
Selected Publication:
1. Bicket MC, Long JJ, Pronovost PJ, Alexander GC, Wu CL. Prescription Opioid Analgesics Commonly Unused After Surgery: A Systematic Review. JAMA Surgery. 2017;152(11):1066-71.

Dr Rebecca Roubin

Digital Health and Pharmacy education – learning and teaching, assessments

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- **Research Group**: 7 capstone MPharm students, 1 summer BPharm student

Project 1: Digital health innovations, pandemics, and pharmacy education - cohesive alignment with stakeholder opinions
Co-Supervisor: Prof Bandana Saini
Project Summary: To explore the perspective of final year (BPharm and MPharm) students and pharmacy practitioners about digital health education and pharmacy curricula. You will Develop an open-ended focus group discussion (FGD) guide, based on the literature and the education delivery experience of the research group. The FGD guide will have two main parts 1) Current training and practice and 2) Future training and practice. The latter part of the guide will contain brief video snippets and exemplars of digital health innovations to stimulate discussions and reflection. You will Recruit approximately 30 final year students (for 4 focus groups) and 25 practicing pharmacists/pharmacy educators (for 3 focus groups) and conduct focus group discussions. The focus group with students will be led by an experienced collaborator from outside the School. You will Analyse the transcribed focus group discussions inductively using thematic analysis, Prepare a Document feeder for Pharmacy Curricula that depicts the stakeholder's key recommendations, and manuscript for publication.
Techniques/Methods: qualitative methods (focus groups)
Selected Publication: Waseh S, Dicker AP. Telemedicine training in undergraduate medical education: mixed-methods review. JMIR Med Educ. 2019;5:e12515.

Project 2: Work-readiness of pharmacy students and graduates
Co-Supervisors: A/Prof Betty Chaar and A/Prof Rebekah Moles
Project Summary: The project will develop evaluation tools of student competence levels after undertaking integrated curricula in pharmacy education, to better inform Pharmacy curriculum reviews. You will develop a survey and an online MCQ competency test based on previous objective structured clinical examinations (OSCE), Develop a preceptor/employer survey investigating their experiences and perspectives regarding competence of pharmacy graduates, Conduct face-validation testing of the survey and online test on current cohort of integrated curriculum students in the Pharmacy programs, Post the online test and surveys on suitable internet platforms, preferably those belonging to professional pharmacy bodies, to pharmacy graduates that had undergone integrated vs non-integrated curriculum, Analyse survey data collected pre- and post the completion of the online test, Conduct interviews with some of the survey participants to gain a deeper understanding of their views on online MCQ competency test.
Techniques/Methods: Mixed method approach will be adopted: simple quantitative [pre-post test surveys] and qualitative methods (focus groups) will be utilised to elicit students' perspectives on competence. This will involve online test development.
Selected Publication: Husband AK, Todd A, Fulton J. Integrating science and practice in pharmacy curricula. *American Journal of Pharmaceutical Education.* 2014;78(3):63.

Professor Bandana Saini

Research Passion – respiratory and sleep pharmacy health services research.

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- **Research Group**: Pharmacy Practice (Sydney Pharmacy School), Sleep and Circadian Group at the Woolcock Institute of Medical Research, the Brain and Mind Centre (USyd) and the CogSleep NHMRC Centre of Research Excellence

Project 1: Early recognition of cognitive dysfunction – a potential role for pharmacists

Co-Supervisors: A/Prof Danijela Gnjidic (Sydney Pharmacy School) and other co-investigators from the Brain and Mind Centre Healthy Brain Ageing Clinic

Project Summary: Timely recognition of early stages in dementia is important so that preventive measures to reduce risk factors can be taken which can possibly delay or even halt progression. However, people at early stages of dementia are not always picked up within the health system. Most people aged over 50 do regularly visit their community pharmacy to purchase prescription medications. Pharmacies are good venues for initiating discussions about early-stage dementia given frequent access by those likely at risk and pharmacists can review use of alertness impairing medicines. However, whether consumers likely at risk of dementia are willing to participate in pharmacy housed screening/triage program is not known – and exploring will be the aim of this project.

Techniques/Methods: We will conduct semi-structured interviews with consumes likely at risk of cognitive dysfunction to map their perceptions about pharmacies as potential screening sites for early signs of cognitive dysfunction in older people. Data analysis will be undertaken using inductive thematic analysis. The results will inform the development of future pharmacy screening services.

Selected Publication: Climent MT, Pardo J, Muñoz-Almaraz FJ et al. Decision Tree for Early Detection of Cognitive Impairment by Community Pharmacists. *Front Pharmacol*. 2018 Oct 29;9:1232.

Project 2: Determining the prevalence of sleep disorders in end stage kidney disease

Co-Supervisor: Dr Ronald Castelino (Sydney Pharmacy School)

Project Summary: Sleep disorders are common in patients with end-stage kidney disease (ESKD) and tend to be under-recognised by renal healthcare providers. These include sleep apnea, insomnia, hypersomnia, restless legs syndrome and periodic limb movement disorders. Sleep disorders can affect the quality of life, and some are associated with increased morbidity and mortality in patients with ESKD). The main objective of this study is to determine the prevalence of sleep disorders in ESKD patients. Techniques/Methods: The study will be conducted at Blacktown hospital. Blacktown hospital is one of the 5 hospitals under Western Renal Service which provides renal replacement therapy for over 800 patients across Western Sydney Local Health District and Nepean and Blue Mountains Local Health District. Patients >18 years who are on dialysis will be invited to participate in the study. Patients will be screened using validated questionnaires such as OSA-50, International Restless Legs Severity Rating scale and the Insomnia Severity Scale.

Selected Publication: Pierratos A, Hanly PJ. Sleep disorders over the full range of chronic kidney disease. Blood Purif. 2011;31(1-3):146-50.

Dr Mouna Sawan and Associate Professor Danijela Gnjidic


Our research is primarily focused on informing the Quality Use of Medicines in older adults. We conduct studies in clinical and geriatric pharmacology, clinical studies on polypharmacy and deprescribing, in older adults with dementia and their carers, and large-scale observational studies.

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- **Research Group**: Multi-disciplinary research group of post-doctoral researcher, 4 PhD students, 2 MPhil students, and 2 honours students.

Project: Involving carers in medication management guidance at hospital discharge

Project summary: People living with dementia are more likely to be exposed to inappropriate polypharmacy and experience worse outcomes than people without a dementia. Carers play an important role in overseeing medications for the person with dementia. This research aims to develop a consumer information resource kit provided to people living with dementia and their carers to improve medication management guidance at discharge.

Techniques/Methods:
We will undertake a mixed-methods study in which qualitative and quantitative data will be collected to provide complementary insights of experiences of carers in medication management guidance for people living with dementia at discharge and to allow for triangulation:
1. Systematic review: A systematic review/ environment scan on the available print and nonprint consumer resources for medication management guidance at discharge.
2. Establish consumer priorities: Consumer priorities for the effectiveness of medicines management guidance for people living with dementia at discharge will be identified using a Delphi consensus method involving carers and people living with dementia.
3. Survey Study: A tool has been developed to evaluate medication management guidance provided to carers of people living with dementia at hospital discharge. We will distribute the tool on-line and hardcopy to carers via professional networks and consumer advocacy groups.

Selected Publication: Sawan MJ, Jeon Y-H, Bond C, Hilmer SN, Chen TF, Wennekers D, et al. Caregivers' experiences of medication management advice for people living with dementia at discharge. J Eval Clin Pract.n/a(n/a). doi:https://doi.org/10.1111/jep.13551.

Dr Carl Schneider

Current research interests involve optimising the Quality Use of Medicines via health services implementation. I am also interested in clinical decision making and health professional education.

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- **Research Group**: We currently supervise seven higher degree of research students and have a very collegial atmosphere up here on Level 5. Sydney Pharmacy School hosts one of the largest groups of Social Pharmacy researchers in the world.

Project: Usability testing of evidence-based opioid deprescribing guidelines

Co-Supervisors: Ms Aili Langford (PhD Candidate), A/Prof Danijela Gnjidic, Prof Christine Lin
Project Summary: Inappropriate prescribing of opioids is a major international public health problem. There is an urgent need for interventions to reduce opioid prescribing, however, pain can be difficult to manage, and for patients already on opioids, withdrawal of therapy can be challenging. We are developing the first international evidence-based opioid deprescribing guideline, to provide guidance to primary care physicians on when and how to stop opioids. End-user consultation is integral to ensure acceptability and usability of guidelines. Usability testing is the process of observing users interact with a document to identify human factor design flaws, and assess whether people can find and understand the information they need. It has been shown to improve both the retrieval and comprehension of guideline information, as well as enhance clinician performance. The aim of this study is to develop and conduct usability testing of the opioid deprescribing guideline and engage in an iterative redesign process to ensure that the guideline is an acceptable and useful tool for primary care physicians.

Techniques/Methods:
Qualitative Interviews: We will recruit a purposive sample of primary care physicians to engage in usability testing, with varying clinical experience and across varying practice settings. Testing will comprise of a semi-structured interview to explore participant's opinions on the content, length, design, and language of the guideline and ascertain perceived usefulness, perceived ease of use, attitudes towards using and intentions to use the guideline. We will perform iterative cycles of re-drafting the guideline and re-interviewing participants as necessary (i.e. until no or very minor suggestions for design improvements are identified (data saturation) and participants had an overall positive impression of the guideline).
Quantitative Usability Testing: Participants will be asked to complete the System Usability Scale (SUS)[1] to rate the usability of the guideline.

Selected Publications:

i) Jones MD, Franklin BD, Watson MC, Raynor DK. User Testing to Improve Retrieval and Comprehension of Information in Guidelines to Improve Medicines Safety. J Patient Saf. 2020.
ii) Jones MD, McGrogan A, Raynor DK, et al. User-testing guidelines to improve the safety of intravenous medicines administration: a randomised in situ simulation study. BMJ Quality & Safety. 2021;30:17-26.
iii) Bangor A, Kortum P, Miller J. Determining what individual SUS scores mean: Adding an adjective rating scale. Journal of usability studies. 2009;4(3):114-123.

Dr Sophie Stocker

My research focuses on understanding variability in response to medicines and how this can be managed to optimise patient care. I utilise a diverse range of quantitative (ethnopharmacology, pharmacogenomics, therapeutic drug monitoring, pharmacometrics) and qualitative (interviews, surveys) approaches to evaluate the impact of intrinsic and extrinsic factors on drug disposition, efficacy and safety.

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- **Research Group**: 4 PhD students, 2 Honours students

Project 1: Understanding healthcare professional's perspectives and opinions on a point-of-care urate testing device to assist with managing gout

Co-Supervisor: Professor Parisa Aslani
Project Summary: Gout, a common form of arthritis with significant impact on quality of life, can potentially be cured with optimal urate lowering therapy. However, suboptimal management of gout (poor urate control) is common. This project **aims** to understand the perspectives and opinions of healthcare professionals, including pharmacists, general practitioners and rheumatologists on the clinical utility, of a commercially available point-of-care urate testing device to assist gout patients to monitor their urate concentrations. Participants will be recruited across Australia from metropolitan and remote/rural locations. This study will inform the design and implementation of an intervention to improve the use of urate lowering therapy.
Techniques/Methods: Semi-structured interviews will be conducted with healthcare professionals. Techniques include literature review, interview skills, thematic analysis and manuscript writing.
Selected Publication: Latif ZP et al. *Joint Bone Spine* 2019;86(3):357-362. PMID: 30394337

Project 2: Physiologically-based pharmacokinetic model development to inform paediatric dosing – exploring carboxylesterase metabolism

Co-Supervisor: Dr Noelia Nebot
Project Summary: Physiologically based pharmacokinetic (PBPK) models are increasingly used to support paediatric dose selection for small molecule drugs. Most of the models that have been utilised are for small molecules where cytochrome P450 metabolism is the main clearance pathway. However, there are newer oncology agents such as trametinib and nirapanib that are metabolised primarily through carboxylesterases and limited experience exists with this pathway. This project **aims** to understand the potential differences in pharmacokinetics in paediatric subjects due to the ontogeny of drug elimination with a focus on carboxylase metabolism. This work will be done through a literature review and may apply the use PBPK modelling and simulation to understand impact on a real example where model parameters can be derived from the literature. Other factors that will also be evaluated will include rate of organ maturation, blood flow, body composition and ontogeny of transport mechanisms.

Dr Edwin Tan

I am passionate about healthy ageing and the important role medications can play in this. My research interests are in pharmacoepidemiology, pharmacy practice, quality use of medicines, and cognitive health and ageing.

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- **Location**: Sydney Pharmacy School
- **Academic Profile**: https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/edwin-tan.html

- **Research Group**: 1 PhD, 1 MPhil, 2 Honours, 1 research officer

Project: The healthcare experiences of older adults worldwide: how does Australia compare?

Co-Supervisors: Assoc Prof. Chris Lu and Prof. Darren Toh (Harvard University)

Project Summary: High-income countries are faced with the challenge of caring for aging populations. Older adults often have complex care needs, resulting from the co-occurrence of multiple chronic conditions, polypharmacy, and reduced functional ability. The aim of this study is to investigate the healthcare experiences of older adults including barriers to access, care coordination and utilisation of health services across 11 countries.

This will be a secondary analysis of data from a nationally representative sample of older adults aged 65 and older (n=18,477) in Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom, and the United States.

The prevalence of cost-related access problems, poorly coordinated care, medical errors and preventable emergency department visits and hospitalisations will be compared between Australia and other countries. A range of sociodemographic, economic, clinical and environmental risk factors for poor outcomes will be determined. Findings of this study may be used to inform health policy regarding the delivery of health care to older adults with complex needs.

Techniques/Methods:
Systematic review and meta-analysis; data analysis, visualisation and interpretation; manuscript writing.

Dr Irene Um

I am interested in transforming the pharmacy profession towards meeting present and future societal needs. My main areas of research include overweight and obesity; health services; and pharmacy education.

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- **Research Group**: Two HDR students

Project 1: Dispensing by Intern Pharmacists (DIP) Study

Co-Supervisor: Josephine Crockett (University of South Australia)
Project Summary: Dispensing medicines is a key duty and foundational competency of intern pharmacists. Documenting and reflecting on near misses and dispensing errors is critical in minimising the possibility of recurrence and is part of good dispensing practice. As part of the NAPE Pharmacy Intern Training Program coursework, intern pharmacists complete dispensing-related learning activities including a 100-item dispensing log and written reflection. The aim of this research study is to examine the dispensing practices of intern pharmacists.
Techniques/Methods: Data collection from learning activities submissions, quantitative and/or qualitative data analyses.
Selected Publication: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6788141/

Project 2: Transitioning into the workforce (ToW) Study

Co-Supervisor: Andrew Bartlett (Illawarra Shoalhaven LHD)
Project Summary: Transitioning from being a student to an independent health professional in the workforce is a challenging and stressful time. Problems such as burnout, job dissatisfaction, and attrition have been reported in the literature. A previous Australian study by Mak *et al*. (2013) found that intern pharmacists felt prepared for clinical activities such as patient care and medicines information, however 45% of respondents reported that they wanted to do something else other than being a pharmacist, and there were also comments that *"university pharmacy education was not preparing them for the realities of practice."* Resilience training in undergraduate curricula may assist graduates to deal with change and the uncertainties they will face in the workforce. The aim of this research study is to explore students' and graduates' needs in transitioning into the health workforce.
Techniques/Methods: Interviews and qualitative data analyses.
Selected Publication: https://doi.org/10.46542/pe.2021.211.263266.

Dr Connie Van

I am passionate about health services research particularly the development/evaluation of interventions that improve the quality use of medicines, application of behaviour change theory to intervention design and interprofessional collaboration. I mainly use quantitative, qualitative and mixed-methods approaches.

- **Contact**: connie.van@sydney.edu.au
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- **Research Group**: 2 PhD students, 1 MPhil student

Project: Evaluating the impact of pharmacist involvement in an outpatient heart failure clinic at Blacktown hospital

Co-Supervisor: Dr Ronald Castelino

Project Summary: People with heart failure experience poor outcomes - median survival following a diagnosis is 3 to 5 years and many patients have poor quality of life. Heart failure is a complex syndrome requiring multiple drug therapies to provide symptom relief, prevent hospitalisation and reduce mortality. Complex drug regimens increase the chance of patient confusion, non-adherence to medicines as well as unwanted side effects. Pharmacists play an important role within a multidisciplinary health care team in the care of patients with heart failure. However, to date, pharmacists' involvement in outpatient heart failure clinics has been limited. This study will explore the impact of pharmacist involvement in an outpatient heart failure clinic at Blacktown hospital.

Techniques/Methods: Data collection, quantitative analysis and interpretation, manuscript writing.

Selected Publication: Schumacher, P. M., Becker, N., Tsuyuki, R. T., Griese-Mammen, N., Koshman, S. L., McDonald, M. A., ... & Schulz, M. (2021). The evidence for pharmacist care in outpatients with heart failure: a systematic review and meta-analysis. *ESC Heart Failure*.

Dr Pegah Varamini

I lead the Breast Cancer Targeting & Drug Delivery group. My team develops new therapies for targeted treatment of Triple Negative Breast Cancer (TNBC), characterised by the most aggressive behaviour and the poorest prognosis. This is mainly because no effective targeted therapy is available. A primary stream of our research involves fabrication, target functionalisation, and characterisation of nanosystems. We use different 2D and 3D cell models, animal models and imaging systems to evaluate the biological behaviour of our drug delivery systems (DDS).

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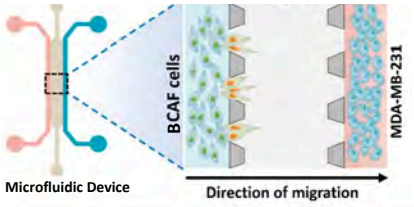
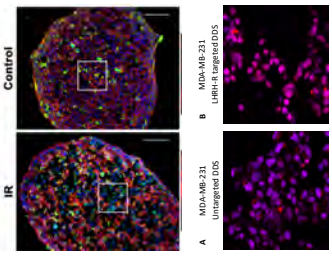
- **Research Group**: Breast Cancer Targeting & Drug Delivery (BCTDD) group

Project 1: A new strategy to overcome TNBC metastasis: combining novel targeted therapeutic candidates with an anti-Breast Cancer-Associated Fibroblast (BCAF) agent
Co-Supervisor: Prof Majid Warkiani



Project Summary: Breast Cancer-Associated Fibroblasts (BCAF) have shown evolving evidence that they are actively involved in breast cancer invasion and metastasis, leading to poor prognosis of TNBC. In this project, we examine the anticancer activity of our novel peptide-based DDSs in combination with an anti-BCAF agent to prevent invasion. The combined therapeutic agents will be tested in a BCAF and TNBC cells co-culture in a 3D microfluidic cell culture device. In addition, the cytotoxicity against TNBC cells as well as the invasion and migration capacity of TNBC cells and BCAFs will be examined by various techniques.
Techniques/Methods: 2D and 3D cell culture techniques in a microfluidic device, BCAF generation, cytotoxicity assay (Alamar Blue), live-cell imaging (IncuCyte), uptake studies (confocal imaging).
Selected Publication: 1) Varamini P. et.al. (2017). *Int J Pharm* 521:327-336. **2)** Aboulkheyr Es, H., et al., *Integrative Biology,* 2020. 12(7): p. 188-197. **3)** Zolghadr, F., et al. (2017). *Insights in Stem Cells*, 3(1:2), 1-

Project 2: Novel GnRH-conjugated nano-theranostics to treat chemoresistant TNBC cells
Co-Supervisor: Dr Naisana Seyedasli



Project Summary: One of the primary reasons for the poor prognosis of TNBC is chemoresistance and the lack of specificity of treatment. To overcome these and monitor the therapy, we are developing novel targeted nano-theranostic agents that have the potential to treat chemoresistant TNBC cells and allow monitoring of the treatment. In this project, we fabricate nanoparticles and then examine their antitumour activity in a resistant TNBC cell line. We will further investigate the mechanisms through which the nanoparticles exert their activity in these cells.
Techniques/Methods: Nanoparticle fabrication and characterisation (HPLC and DLS), 2D and 3D cell culture techniques, cytotoxicity assay (Alamar Blue) and live-cell imaging (IncuCyte), cell cycle analysis and apoptosis (Flowcytometry).
Selected Publication: 1) Ghaly HSA, Varamini P. Endocr Relat Cancer. 2021 Sep 8;28(11):R251-R269. **2)** Zolghadr, F., et al. (2017). *Insights in Stem Cells*, 3(1:2), 1-3.

Associate Professor Nial Wheate

My training is in medicinal chemistry (design and synthesis of active pharmaceutical ingredients) and pharmaceutical chemistry (design and manufacture of pharmaceutical dosage formulations). My research interests are particularly focussed in the improved delivery of established medicines and the drug delivery applications of macrocycles and nanoparticles. I also maintain an interest in the development of cannabis as a pharmaceutical product.

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Project 1: Medicinal cannabis use by Sydney-based patients
Co-Supervisor: Ms Elise Schubert
Project Summary: In 2016, the Australian government changed the scheduling of cannabis from S9 to S8 for medical purposes; however, while the rest of the whole treats cannabis as a herbal and complementary medicine, Australia has taken an approach of treating medicinal cannabis as a pharmaceutical product, the same as all other medicines. This means that cannabis-based dosage forms must be manufactured to exact specifications, and before a product can be placed on the Australian Register of Therapeutic Goods (ARTG) it must have undergone clinical trials to demonstrate safety and efficacy.
However, even before a product is placed on the ARTG it can be available to patients through an Authorised Prescriber or through Special Access Scheme – B. Patients who access medicinal cannabis in these ways may do so for diseases and conditions for which efficacy has not yet been proven, and where an ideal formulation and dose has not yet been determined. As such, there is likely to be variance between patients.
In this project the student will work collaboratively with Cannabis Access (CA) clinics and Applied Cannabis Research (ACR) to analyse patient data that has already been collected by via the CACOS project to examine aspects of efficacy, side-effects, drug-drug interactions, and reduced used of other medicines. The exact nature of the disease/condition to be analysed, and the goals of the analysis, will be decided closer to the selected student's start date.

Project 2: Development of a slow-release formulation of meloxicam for the treatment of chronic pain in koalas
Co-Supervisor: Associate Professor Merran Govendir (University of Sydney Veterinary School)
Project Summary: Like many animals, koalas can be affected by inflammation and chronic pain. Unfortunately, because of their eucalyptus-based diet, they also hyper-metabolisers. As such, slow-release formulations of medications are needed to provide a continuous supply of drug. Working in conjunction with the University of Sydney Veterinary School the student will develop and test slow-release injectable formulations of meloxicam.

The project will require the student to undertake laboratory-based research utilising knowledge learnt across many pharmaceutical science units of study. The student will prepare formulations from different solvents and determine their drug release profiles in simulated blood serum. In doing so, the student will need to become competent in pharmaceutical calculations and data analysis. But students will develop these skills as part of the research and do not need to already consider themselves experts in calculations and analysis.

There is the potential for the student to be involved in the animal testing of their formulations with the vet school.

Associate Professor Fanfan Zhou

My research group is a young and dynamic team with PhD students, visiting scholars/students and honors students. Our research is focused primarily on two themes: the identification of new agents for the treatment of human eye diseases and the molecular characterisation of human Solute Carrier Transporters that control drug uptake into tissues. I have established a research consortium that includes national and international experts in these two fields and welcome you joining our group.

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- **Research Group**: PhD and M. Phil. candidates

Project 1: Discover new drugs to treat human Uveal melanoma (UM)

Co-Supervisor: Prof. Michael Murray, A/Prof. Michele Madigan, Dr. Svetlana Cherepanoff, A/Prof. Max Conway

Project Summary: Uveal melanoma (UM) accounts for ~85% of all ocular melanomas in humans. Up to 50% of patients develop metastatic disease that has a poor survival of <18 months. By screening natural compounds and their derivatives that are available in our laboratory, we will identify potential drug candidates with activity against human UM cells and UM metastasis. It is expected that these compounds target specific cellular organelles to exert their anti-cancer effects. In this project we will use a range of modern molecular and biochemical approaches to define the detailed mode of action of these candidate molecules in combating UM growth and invasion. The molecular targets for these candidate compounds in UM will be identified. This study will utilize established UM cell lines and primary UM tumor-derived cell cultures that represent a unique resource available to our group. The findings from this project will provide critical pre-clinical data to justify the therapeutic application of the natural compounds or their derivatives as potential treatments for UM.

Techniques/Methods: tissue culture, cell viability and cell death assays, western blotting, flow cytometry

Selected Publication: Exp Cell Res. 2019 Jul 22:111509 & Exp Eye Res. 2018 Dec 19;180:92-10 & FEBS 2021 Apr 10. doi: 10.1111/febs.15869