

PROJECT INFORMATION # 1**Project Title**

Targeting cholesterol-related processes for improved therapy in acute myeloid leukaemia.

Hypothesis:

Geranylgeranyl transferase inhibitor co-treatment enhances hypomethylating agent efficacy in acute myeloid leukaemia

PROJECT ATTRIBUTES AND BENEFIT TO THE STUDENT**Brief description of project:**

Acute myeloid leukaemia is a rare but deadly blood cancer that is characterised by genetic, epigenetic and metabolic dysregulation. Standard treatment involves cytotoxic chemotherapies, which are highly toxic and can be dangerous for older patients or those with additional health concerns. Alternatively, low-intensity epigenetic therapies called hypomethylating agents (HMAs) can be used. We have discovered that cells surviving HMA treatment have increased dependence on cholesterol-related processes and can be targeted by co-treatment with cholesterol-lowering medications (statins) (Bond, Burnard *et al.* Leukaemia 2025). Furthermore, recent experiments suggest that increased cholesterol processing supports cancer cells via the prenylation pathway which can be blocked by geranylgeranyl transferase inhibitors (GGTIs). This project aims to further refine AML treatment strategies by testing HMA and GGTi co-treatment in human cancer cell lines.

Student's role in the project:

The successful student will work alongside a PhD student and Research Assistant to conduct experiments in human cancer cell lines.

Student's benefit from their involvement:

This project offers an opportunity to see medical research in practice. The successful student will join a team of 7 staff and students, and gain insights into cancer biology, genetic regulation, and metabolic processes. The following skills will be developed:

1. General laboratory skills
2. Cancer cell culture and drug treatments
3. Analysis of cell growth and cancer-initiating capacity (colony-forming assays)
4. Experiment design and trouble-shooting
5. Teamwork and communication skills
6. Time management and professional skills

Research Location Information (where the project work will be conducted)

Campus: John Hunter Hospital Campus

Building & room number Hunter Medical Research Institute, Level 2 West

Supervisor's Information (primary supervisor should be in SBSP)**Supervisor Name:**

A/Prof Heather Lee

Academic Appointment at UON:

NHMRC Research Fellow and Associate Professor

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PROJECT INFORMATION # 2

Project Title

Uncovering the hidden role of brown fat oxidative stress in cachexia linked to colorectal cancer

Hypothesis:

The oxidative stress gene response in brown fat will be triggered by colorectal cancer and can be rebalanced by overexpression of a mitochondrial antioxidant.

PROJECT ATTRIBUTES AND BENEFIT TO THE STUDENT

Brief description of project:

Patients with advanced cancer often lose a lot of weight (known as cachexia), which greatly reduces their quality of life and chances of survival. Cancer causes the body to experience oxidative stress and inflammation, affecting different tissues, including fat. Brown fat plays a critical role in thermogenesis through a metabolically inefficient process, which is believed to contribute to the hypermetabolic state seen in cachexia. Brown fat also secretes important factors that can affect heart and muscle tissue wasting. We hypothesized that oxidative stress may occur in brown fat, leading to its dysregulation during cachexia. To investigate this, we developed a mouse model of colorectal cancer using transgenic mice that overexpress an antioxidant in adipose tissue to mitigate oxidative stress. In these transgenic mice, indications of cachexia were reversed; however, the specific effects on brown fat remain unexplored. The current project aims to characterize the impact of colorectal cancer on the oxidative stress response in brown fat, as well as the effects of antioxidant overexpression.

Student's role in the project:

To complete this project, the student will be trained by experienced lab members in laboratory techniques including protein extractions, western blotting, RNA processing, quantitative PCR, and data analysis/presentation techniques using Graphpad Prism software.

Student's benefit from their involvement:

The student will benefit from experiencing the techniques mentioned above, exposure to a cutting-edge research lab (Newcastle Cardio-Oncology Centre of Excellence) in the newly emerging field of Cardio-oncology, learning from experienced lab members, all within a supportive environment. There will be opportunities available for suitable students to progress to work integrated learning projects or honours projects.

Research Location Information (where the project work will be conducted)

Campus: Hunter Medical Research Institute

Building & room number HMRI Level 2 East

Supervisor's Information (primary supervisor should be in SBSP)

Supervisor Name:

Professor Doan Ngo

Ongoing academic

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PROJECT INFORMATION # 3

Project Title: Unlocking General Practitioners Pathways to Exercise Physiology for Psychological Injury Recovery in Australia

PROJECT ATTRIBUTES AND BENEFIT TO THE STUDENT**Brief description of project:**

One in 11 serious worker's compensation claims are psychological injuries. Compared with physical injuries, psychological injuries quadruple the time off work and benefits paid by insurers and reduce the return-to-work rate by 30%. Despite the robust evidence for exercise to improve mental health, referral of workers with psychological injury to accredited exercise physiologists is significantly delayed or does not occur. Our project will develop resources aimed at general practitioners, advocating for exercise services delivered by accredited exercise physiologists, to increase the frequency and timeliness of referrals. This will ultimately improve health and return-to-work outcomes for people with psychological injury. We will work alongside current practitioners (accredited exercise physiologists, general practitioners), insurers, and workers, to ensure the real-world applicability of the resources. We will disseminate these resources to accredited exercise physiologists across Australia to ensure immediate benefit for our profession, as well as for injured workers, insurers, and general practitioners in the worker's compensation systems.

Student's role in the project:

- Dissemination of an online survey assessing barriers and enablers for general practitioner's referring workers with psychological injury to exercise physiology services in Australia
- Recruitment of general practitioners to partake in focus groups further exploring their experiences of referring workers with psychological injury to exercise physiology services in Australia
- Basic survey and focus group data analysis, under supervision
- Assist with developing and/or updating exercise physiology advocacy resources based on survey and focus group data, as well as from feedback from a community of practice including current health practitioners, insurers and injured workers

Student's benefit from their involvement:

Through this project, the student will gain hands-on experience in applied health research within the field of exercise physiology and occupational rehabilitation. They will develop practical skills in survey dissemination, participant recruitment, and qualitative and quantitative data analysis. Working under supervision, the student will also contribute to the translation of research findings into real-world resources that support general practitioners and exercise physiologists in managing workers with psychological injury. This experience will provide valuable insight into interdisciplinary collaboration between healthcare providers, researchers, and insurers, while strengthening the student's understanding of evidence-based practice, communication with stakeholders, and the role of exercise physiology in mental health and return-to-work contexts.

Research Location Information (where the project work will be conducted)

Campus: Callaghan

Building & room number: HPE-108

Please note – some remote work will also be possible

Supervisor's Information (primary supervisor should be in SBSP)

Supervisor Name:

Dr Emily Cox

Academic Appointment at UON:

Lecturer in Clinical Exercise Physiology

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PROJECT INFORMATION # 4

Project Title:

Developing Safer Cancer Treatments: Unravelling the Cardioprotective Mechanisms of Cyclin-dependent Kinase Inhibitors in Anti-cancer Therapies-induced Cardiomyopathy.

Hypothesis: We hypothesise that combining selective Cyclin-dependent Kinase (CDK) inhibitors with conventional anti-cancer agents, such as anthracyclines and proteasome inhibitors, will simultaneously enhance anti-tumour efficacy in breast cancer and multiple myeloma while mitigating treatment-induced cardiotoxicity.

PROJECT ATTRIBUTES AND BENEFIT TO THE STUDENT

Brief description of project:

Cancer survival rates have significantly increased in the last two decades due to emergence of highly effective classes of anti-cancer agents, such as the Anthracyclines (Doxorubicin, Epirubicin, Daunorubicin) and Proteasome inhibitors (Carfilzomib, Bortezomib, Ixazomib). However, these anti-cancer agents have unexpectedly caused cardiovascular toxicity and led to increase incidence of cardiovascular complications (e.g., heart failure, arrhythmias, and cardiac arrest) in cancer patients. It is estimated that over a third of patients who survive more than five years after their cancer diagnosis (>50 million worldwide, ~2 million Australians by 2040) would succumb to these cardiovascular complications rather than their cancer. Moreover, >55% of Australians treated for cancer are thought to have been exposed to one or more of these cardiotoxic anti-cancer agents. Thus, anti-cancer therapies-induced cardiovascular toxicity is an urgent and growing challenge to cancer survivorship care.

We now have uncovered some exciting preliminary results to demonstrate that Cyclin-dependent kinases (CDKs) may play an important role in cardiotoxicity induced by Anthracyclines and Proteasome inhibitors. CDKs are key regulatory enzymes involved in cell proliferation through regulating cell-cycle checkpoints and transcriptional events. Specifically, we found that specific inhibition of CDK9 reduced human cardiomyocyte cell death when exposed to Anthracyclines and Proteasome inhibitor treatments.

We are looking for candidate students to take part in our exciting follow up studies to explore the anti-cancer efficacy of combining these CDK9 inhibitors with anthracyclines and proteasome inhibitors to treat breast cancer and multiple myeloma respectively. Together, we will discover the underlying mechanisms and develop novel cardioprotective interventions. Candidates will learn essential laboratory skills (e.g., pipetting techniques), comprehend on research methods (e.g., RNA extraction, qPCR), and develop a knowledge base on how to manage a biomedical research project (e.g., hypothesis, aims of study, analyse/interpret results). Depending on the candidate's performance and outcome of study, the proposed project could be expanded into a larger study for an Honour and/or PhD project, that the candidate could choose to explore in the near future.

Student's role in the project:

- Learn to perform aseptic techniques and maintain culture of human cardiac cells and cancer cell lines
- Perform cell viability assays
- Collect and isolate RNA for subsequent gene expression analysis (qPCR)
- Harvest cells and culture supernatants for protein analysis (ELISA, Western blot)

Student's benefit from their involvement:

- Learning essential lab skills
- Excellent opportunity to gain lab/research experience.
- Improving teamwork and communication.
- Potential to transition and expand project into an Honours project or PhD degree.

Research Location Information (where the project work will be conducted)**Campus:** Hunter Medical Research Institute (HMRI)**Building & room number:** Level 2 East, Centre of Excellence Newcastle Cardio-Oncology**Supervisor's Information** (primary supervisor should be in SBSP)**Supervisor Name:** Doan Ngo**Academic Appointment at UON:** Professor**Preferred Phone:** 0413822334**E-mail Address:** doan.ngo@newcastle.edu.au

PROJECT INFORMATION # 5

Project Title: Constructing a database of co-morbidities

Hypothesis:

Understanding the patterns of co-occurrences of diseases will help understand their shared underlying causes. It can also uncover yet unknown relationship between diseases and act as an hypothesis generator.

PROJECT ATTRIBUTES AND BENEFIT TO THE STUDENT**Brief description of project:**

This project is bioinformatics based (no wet-lab involved).
 It aims to construct a database of co-occurring diseases using large cohorts (>100,000 individuals). Diseases are usually encoded as ICD-10 codes. For each code pair, we will calculate statistics and construct a database based on the results, presenting users with insightful results.

Student's role in the project:

- 1) Cleaning up dataset
- 2) Calculating statistics
- 3) Construct database
- 4) Presents results as relevant plots and table

Student's benefit from their involvement:

The selected student will learn:

- The basics of computer science for bioinformatics (R or Python coding), bash, Linux, git
- The basics of statistical modelling (linears and logistic regression)
- The basics of plotting

Research Location Information (where the project work will be conducted)

Campus: Callaghan

Building & room number: MS 515

Supervisor's Information (primary supervisor should be in SBSP)

Supervisor Name:	Academic Appointment at UON:
Alexandre Xavier	Lecturer
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PROJECT INFORMATION # 6

Project Title
The impact of dietary BPA exposure on endometrial health
Hypothesis:
Dietary exposure to BPA at levels deemed 'safe' contributes to reduced endometrial health, causing elevated oxidative stress and inflammation.

PROJECT ATTRIBUTES AND BENEFIT TO THE STUDENT

<u>Brief description of project:</u>
Food and drink packaging materials contain Bisphenol A (BPA), which is an endocrine-disrupting chemicals known to transfer into what we consume, posing serious risks to human health. In Australia, dietary BPA contamination is poorly regulated, with the 'safe' daily intake set 250,000-fold higher than Europe. There is growing concern for the effects of BPA on the endometrium, a highly endocrine-responsive tissue. Endometrial dysfunction underpins common gynaecological diseases including endometriosis; a progressive, painful, and incurable disease affecting 1 in 7 females in Australia. Endometrial dysfunction in endometriosis is characterised by estrogen-dependence, inflammation, and oxidative stress. The role of BPA in driving oxidative stress and inflammation in vivo remains unknown; this project will investigate this in endometrial tissues collected from a mouse model of realistic dietary BPA exposure.
<u>Student's role in the project:</u>
Student will learn to carry out experiments with mouse endometrial tissue to assess gene expression via quantitative PCR (qPCR) and protein localisation (immunofluorescence) for key markers of oxidative stress and inflammation pathways.
<u>Student's benefit from their involvement:</u>
Student will experience working in a research environment and gain practical laboratory skills in qPCR and immunofluorescence.
Research Location Information (where the project work will be conducted)
Campus: HMRI
Building & room number Level 3 East

Supervisor's Information (primary supervisor should be in SBSP)	
Supervisor Name: Dr Alexandra Peters	Academic Appointment at UON: Post-doctoral researcher, full time
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PROJECT INFORMATION # 7**Project Title**

Exploring transient translation reset via Poly(A)-targeting oligonucleotides in mammalian cell culture

Hypothesis:

Short-acting ASO and siRNA oligonucleotides that target the poly(A) tail can transiently reduce total RNA and protein synthesis, mimicking the cell's natural ER-stress translation shutdown, without inducing irreversible toxicity.

PROJECT ATTRIBUTES AND BENEFIT TO THE STUDENT**Brief description of project:**

This project will evaluate the biological feasibility of transiently modulating global translation using Poly(A)-targeting oligonucleotides. The student will culture mammalian cells, apply short-lived ASO and siRNA candidates across a concentration range, and measure cellular responses including viability, total RNA, and total protein content before and after treatment. The work will establish preliminary dose-response data and recovery kinetics for this new "translation-reset" concept.

Student's role in the project:

The student will:

- Learn and perform basic mammalian cell culture (seeding, passaging, treatment).
 - Prepare and apply oligonucleotide treatments at multiple concentrations.
 - Conduct cell viability assays (MTT or resazurin).
 - Extract and quantify total RNA and protein pre- and post-treatment.
 - Record, analyze, and graph results under supervision.
- The student will also participate in group discussions interpreting whether observed reductions in RNA/protein are transient or cytotoxic.

Student's benefit from their involvement:

The project provides hands-on experience in molecular pharmacology and gene-modulation technology. The student will develop laboratory skills (sterile technique, viability assays, RNA/protein extraction, data analysis), understand the principles of oligonucleotide therapeutics, and contribute to an early-stage proof-of-concept study. The work may form the basis for a larger honours or postgraduate project.

Research Location Information (where the project work will be conducted)

Campus: University of Newcastle (Callaghan)

Building & room number

Biomedical Sciences Building Room 515/615

Supervisor's Information (primary supervisor should be in SBSP)**Supervisor Name:**

Mark Bigland

Academic Appointment at UON:

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