Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS001
Project title:	**The effect of phosphate availability on immune cell function in preterm neonates**
Discipline:	Biomedical - Liggins Institute
Supervisor(s)	Gergely Toldi (Primary Supervisor) Sagar Nagrekar
Contact details	gergely.toldi@auckland.ac.nz
Skills Needed	• cell isolation from blood • cell cultures • flow cytometry

Project description

Extremely preterm infants have limited nutrient reserves and often require parenteral nutrition. Clinical studies, including the ProVIDe trial, report a high incidence of hypophosphataemia and refeeding syndrome in extremely low birth weight infants, linked to increased infection, morbidity, and mortality rates. Phosphate is essential for ATP production and immune cell activation, supporting processes such as cytokine production, phagocytosis, and antigen presentation. However, human data on the direct effects of phosphate availability on immune function in preterm neonates remain limited.

Hypothesis: Low phosphate availability impairs immune cell function in preterm neonates, contributing to increased morbidity and mortality associated with hypophosphataemia and refeeding syndrome.

In this project, we will collect cord blood samples from term and preterm neonates. Immune cells will be isolated and cultured in varying phosphate concentrations. Immune cell functions, such as cytokine production, cytotoxic activity, activation status, oxidative stress response, and mitochondrial function will be comprehensively assessed using flow cytometry based methods.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS002
Project title:	**Optimising Fast Brain Diffusion MRI**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	A/P David Dubowitz (Primary Supervisor) Tiago Fernandes
Contact details	dubowitz@auckland.ac.nz
Skills Needed	• Data analysis of existing MRI data using standard visualisation software. Some interest in programming as Matlab may be needed (or can be learned). An interest in neuroimaging. Attention to detail is key.

Project description

CAMRI has a scanner capable of very high fidelity brain diffusion MRI. The project is to select the optimum dataset parameters that could be used for fast imaging (and thus wider applicability in elderly or paediatric populations). Datasets have been acquired across multiple volunteers. the student will evaluate different levels of data sparsity to come up with a fast dataset that retains enough info to meet the clinical needs. The final parameter choice will be tested on the CAMRI scanners. Student will work closely with MRI staff and MRI researchers, and is a great opportunity to learn more about MRI.

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2026/2027 Projects (Biomedical)

Project code:	MHS003
Project title:	**Investigating the role of infection and oxygen deprivation on the development of perinatal brain injury**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Alice McDouall (Primary Supervisor) Joanne Davidson
Contact details	a.mcdouall@auckland.ac.nz
Skills Needed	• Immunohistochemistry • Microscopy • Data analysis • Statistical analysis

Project description

At the time of birth, infants may be exposed to reduced oxygen and blood supply (ischemia), which can lead to death or severe brain damage. Currently the only treatment for this type of brain injury is therapeutic hypothermia which involves cooling the infant for 3 days. Hypothermia has been shown to reduce death and disability in these babies. However, there is concern that hypothermia may not work in infants who have been exposed to infection/inflammation in addition to oxygen deprivation.

This summer internship will be investigating whether hypothermia reduces brain injury in term-equivalent fetal sheep that have been exposed to both ischemia and an inflammatory insult. This project will be directly assessing how inflammation contributes to the development of brain injury, looking at neurons, oligodendrocytes and other cells involved in inflammation.

This research will provide valuable insight into how inflammation contributes to the development of perinatal brain injury. Furthermore, this internship will provide pre-clinical evidence for potential treatment strategies in infants who have had an infection and oxygen deprivation to help inform how best to treat these babies in the future.

Please contact us for any more information on this summer studentship, or about other potential Honours or Masters projects.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS004
Project title:	**Estrogen as a modulator of neuroinflammation in dementia**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Amy Smith (Primary Supervisor) Rebecca Johnson
Contact details	amy.smith@auckland.ac.nz
Skills Needed	• Neuroscience and Molecular/Cellular Biology background • Enthusiasm for learning about research • Strong communication, organisation and teamwork skills

Project description

Dementia rates are higher in females than males, however the reasons for this are unclear. Sex differences in immune cells are well-recognised, and this is relevant for the brain's immune cells too. Microglia, the predominant immune cells in the brain, respond to injury and recent evidence suggests that they also contribute to causing dementia. Genetic variation in microglial genes is known to contribute to dementia risk. It is unknown whether female sex influences expression of disease-related microglial genes. This project will begin to investigate whether the estrogen receptor, and estrogen signalling pathways, play an immuno-modulatory role in microglia.

Project code:	MHS005
Project title:	**Menstrual cups and discs: they may be green but are they clean?**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Associate Professor Siouxsie Wiles (Primary Supervisor) Dr Priscila Dauros Singorenko
Contact details	s.wiles@auckland.ac.nz
Skills Needed	• Attention to detail • Good time-keeping

Project description

Menstrual cups and discs are commonly marketed as a safe and sustainable alternative to tampons and other disposable period products. They are becoming increasingly popular with hundreds of different brands available on the market with very different price tags. But it turns out that there has been very little research into how well different bacteria can attach to menstrual cups/discs and form biofilms – the first step in being able to cause infection. This summer scholarship will be working on assessing how bacteria attach to menstrual cups under different lab conditions. Students who are passionate about women's health or microbiology are encouraged to apply.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS006
Project title:	**Baroreflex control of blood pressure in pregnancy**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Carolyn Barrett (Primary Supervisor)
Contact details	c.barrett@auckland.ac.nz
Skills Needed	• Understanding of arterial baroreceptor reflex • Good data analysis skills including competency with Excel. Basic statistical skills and graphing. • Scientific writing

Project description

Pregnancy is a time when the cardiovascular system must undergo significant adaptation. This project will analyse blood pressure data collected in pregnant rats to characterise the blood pressure changes that occur both in normal pregnancy and a model of preeclampsia. The focus will be to characterise the changes in baroreceptor reflex control during pregnancy and determine if this is altered in animals that have been exposed to extracellular vesicles from preeclamptic pregnancies. The results will help in understanding both the normal cardiovascular responses to pregnancy and determine whether the extracellular vesicles do alter baroreflex control in pregnancy.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS007
Project title:	**Building a library of photorealistic 3D images of human organs using photogrammetry: image creation and software development for image hosting**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Cherie Blenkiron (Primary Supervisor) Dr Amanda Charlton, Dr Rachelle Singleton, Seb Barfoot, Dr Komal Srinivasa, David Wilkinson, Dr Deborah Prendergast
Contact details	c.blenkiron@auckland.ac.nz
Skills Needed	• Interest in photography and image editing • Computer software development • Problem-solving • Comfortable handling human organs and tissues

Project description

Background: At FMHS we have a system that creates photorealistic 3D digital images of human organs to enable students to have an interactive learning experience. The 3D images are not currently hosted in an accessible online library.
Objective: You will capture a sequence of high-resolution images from cadaveric organs using an automatically rotating turntable, and high-resolution DSLR camera. You will evaluate existing hosting platforms to develop software for an online image library.
Methods and skills required: The technique is 3D photogrammetry. Watch a video demonstration (https://www.youtube.com/watch?v=YpIGAIQZ0ek). You will be interested in photography and imaging editing software. You will be comfortable with computer software development, be proactive in problem-solving, and comfortable handling human organs and tissues. You will be working in a team environment with another summer student on a complimentary project.
Research impact: You will create new 3D images for teaching and learning and develop software to host an image library. This will create accessible and sustainable teaching resources for all FMHS faculty and students.
Skills learnt: 3D photogrammetry image creation, software development, human anatomy and pathology, teamwork.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS008
Project title:	**Non-Nutritive Sweeteners and Short-Chain Fatty Acid Production: Current Evidence and Implications - A Scoping Review**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Clare Wall (Primary Supervisor) Dr Teresa de Castro
Contact details	c.wall@auckland.ac.nz
Skills Needed	• Literature Search; Critical Appraisal; Understanding of relevant scientific concepts; Data extraction and synthesis; Scientific writing; Referencing and citation management; Basic statistical literacy; Organization management

Project description

Non-nutritive sweeteners (NNS) are widely used sugar substitutes designed to reduce energy intake and support the management of obesity and metabolic diseases. Despite their increasing consumption worldwide, there is ongoing scientific debate regarding their potential effects on gut health. In particular, emerging research suggests that NNS may interact with the gut microbiota and influence the production of short-chain fatty acids (SCFAs), including acetate, propionate, and butyrate, which are essential for maintaining intestinal barrier function, immune regulation, and host metabolic homeostasis. However, current findings are inconsistent, and there is no clear consensus on how different NNS affect SCFA production. Therefore, this scoping review aims to critically evaluate and synthesise existing evidence on the relationship between NNS consumption and SCFA production.

A systematic literature search will be conducted using electronic databases such as PubMed, Scopus, and Web of Science. Peer-reviewed studies involving in vitro, animal, and human models will be included if they examine the effects of commonly consumed NNS, including aspartame, sucralose, saccharin, and steviol glycosides, on gut microbiota composition or SCFA levels. Studies will be screened using predefined inclusion and exclusion criteria, and data will be extracted and compared based on study design, NNS type, dosage, duration, and measured outcomes. The evidence will then be thematically analysed to identify key patterns, limitations, and gaps in the literature.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS009
Project title:	**Image analysis of muscle biopsy tissue for diagnosis**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Clinton Turner (Primary Supervisor) Dr. Amanda Charlton
Contact details	clintont@adhb.govt.nz
Skills Needed	• ideal project for a biomedical-engineering, computer-science, or data-science student • interested in image analysis, software scripting, and digital diagnostics. • comfortable working independently, engaging with online tech forums like the QuPath com

Project description

Background: Diagnosing complex muscle diseases relies on microscopic examination of muscle biopsies, including quantifying fibre type and diameter. The current method requires pathologists to perform manual, time-consuming measurements on digital images

Objective: Develop automated muscle quantitative analysis to accelerate diagnosis without sacrificing accuracy.

Methods and student role: Working with digital images of skeletal muscle dual-stained in red and brown, you will use the open-source image analysis platform QuPath. You will integrate deep learning models via extensions such as Cellpose, StarDist and InstanSeg to automate myofibre segmentation. You will use QuPath machine learning object classifiers to handle dual-stain data. Your automation will measure myofibre diameter, area, fibre type, and generate percentage and size distribution charts. You will validate your automated outputs against manual pathologist measurements to assess accuracy. Finally you will write plain language instructions for pathologists, and present at an appropriate forum.

Student skills & Attributes: This project is ideal for a biomedical-engineering, computer-science, or data-science student interested in image analysis, software scripting, and digital diagnostics. You will be comfortable working independently, engaging with online tech forums like the QuPath community and be a proactive problem-solver. You will gain highly transferable skills in biomedical quantitative image analysis.

References

Bankhead P, Loughrey MB, Fernández JA, Dombrowski Y, McArt DG, Dunne PD, et al. QuPath: Open source software for digital pathology image analysis. Sci Rep. 2017 Dec 4;7(1):16878. doi:10.1038/s41598-017-17204-5

Waisman A, Norris AM, Elías Costa M, Kopinke D. Automatic and unbiased segmentation and quantification of myofibers in skeletal muscle. Sci Rep. 2021 Jun 3;11:11793. doi:10.1038/s41598-021-91191-6 PubMed PMID: 34083673; PubMed Central PMCID: PMC8175575.

Schmidt, U., Weigert, M., Broaddus, C., & Myers, G. (2018). Cell Detection with Star-convex Polygons. ArXiv. https://doi.org/10.1007/978-3-030-00934-2_30

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2026/2027 Projects (Biomedical)

Project code:	MHS010
Project title:	**Chemical biology for SHOC2 - a new drug target for melanoma**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Daniel Conole (Primary Supervisor) Steve Jamieson Lydia Liew
Contact details	daniel.conole@auckland.ac.nz
Skills Needed	• Synthetic organic chemistry • Molecular biology • Drug binding assay development

Project description

Melanoma is a deadly type of skin cancer that is especially common in New Zealand. About 20% of melanoma cases have NRAS mutations and have poor outcomes with few available treatments. We have identified a protein called SHOC2 that is essential to the survival of NRAS-mutant melanoma cells. Recently, the first small molecule to interact with SHOC2 was published. This project will involve the synthesis of this new SHOC2 inhibitor and other, similar molecules to be used as tools in assays for a broader drug discovery programme. The student will join a drug discovery team of computational experts, chemists, pharmacologists and cancer biologists, and the compounds synthesised in this project could likely be trialled in various drug discovery assays in a subsequent honours degree (also conducted by the student).

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS011
Project title:	**Reversing heart failure with natures pacemaker**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	David Crossman (Primary Supervisor) Rohit Ramachndra Julian Paton
Contact details	d.crossman@auckland.ac.nz
Skills Needed	• Interest in cardiovascular science, immunohistochemistry, and super-resolution microscopy

Project description

In this project, you will investigate how a novel cardiac pacing strategy improves the function of the failing heart. We have discovered that restoring respiratory heart rate variability in heart failure improves cardiac output by approximately 25% — a response that may exceed that achieved with many current medical therapies.

Respiratory heart rate variability is the natural variation in heart rhythm in which breathing in slightly increases heart rate, while breathing out slows it down. This physiological rhythm is highly conserved across the animal kingdom and is especially prominent in healthy, highly fit individuals such as athletes. Unfortunately, this natural phenomenon is diminished or lost in heart disease.

Our recent findings suggest that respiratory heart rate variability pacing improves the energetics of the failing heart. In this project, you will use advanced high-resolution microscopy to determine whether this pacing strategy restores mitochondrial structure in heart failure. Mitochondria are the sub-cellular organelles responsible for producing the energy required for cardiac function.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS012
Project title:	**Developing the next generation sensors for ESF**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	David Cumin (Primary Supervisor) Nitish Patel (engineering)
Contact details	d.cumin@auckland.ac.nz
Skills Needed	• Electronic circuit and PCB design; soldering.

Project description

Working with colleagues in Germany, we have developed a novel sensor technology for measuring electrostatic fields.

We need help with designing and building the next generation, with PCB-integrated antennae. With guidance from engineering, you will be responsible for building the PCB and building and testing the design.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS013
Project title:	**The impact of poor parental diet and metabolic health on offspring bone properties**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	David Musson (Primary Supervisor)
Contact details	d.musson@auckland.ac.nz
Skills Needed	• Attention to detail

Project description

This project will explore how poor diet/metabolic health in Mums and Dads affects the strength of their children's bones. It will also test whether giving omega-3 at a young age can help reverse any effects.

Bones have been collected from offspring rats whose Mums and Dads were exposed to a high-fat, high-sugar (HFHS) diet pre-conception, and offspring who were given omega-3 as a recovery treatment. This student project will biomechanically test the strength of these bones to determine:

1. The independent and synergistic effects of maternal and paternal HFHS diets on offspring bone strength.
2. Whether omega-3 fatty acid supplementation can attenuate negative programming effects in the offspring.
3. Whether parent- or offspring-metabolic outcomes correlate with offspring bone strength.

Understanding how parental health influences offspring bone outcomes and whether omega-3 can mitigate these effects is critical for improving tamariki's long-term health. In Aotearoa New Zealand, 34% of adults and 13% of children are obese. Of concern, over half of women of reproductive age have overweight or obesity, and one in five are obese during pregnancy. Maternal obesity has well-established adverse effects in offspring, while paternal obesity is increasingly recognised as contributing to offspring's health. The bone effects remain unclear.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS014
Project title:	**Development of PHD2-Targeting PROTACs for Cancer Therapy**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Dean Singleton (Primary Supervisor) Daniel Conole Lydia Liew
Contact details	d.singleton@auckland.ac.nz
Skills Needed	Skills that will be taught: • Cell culture • Live-cell imaging • High-content fluorescence microscopy • Gene expression analysis (western blotting, RT-qPCR)

Project description

This project aims to develop a targeted protein degradation strategy against Prolyl Hydroxylase Domain Protein 2 (PHD2), a key regulator of hypoxia-inducible factor (HIF) signalling. We have found that certain cancer types are highly vulnerable to manipulation of the hypoxia response pathway resulting from PHD2 inhibition by CRISPR-Cas9 KO or treatment with small molecules.

We have designed and synthesised novel PROTAC (proteolysis-targeting chimera) molecules capable of selectively binding PHD2 and recruiting an E3 ubiquitin ligase to induce its ubiquitination and subsequent proteasomal degradation. This approach offers a distinct advantage over traditional inhibition by removing the target protein entirely, potentially achieving more sustained and potent modulation of hypoxia signalling pathways and greater anticancer effects.

The project will involve evaluating the degradation efficiency, selectivity, and downstream biological effects of these novel PROTACs in cancer cell models. Lead PROTAC candidates will be assessed for their ability to modulate HIF activity and suppress cancer cell proliferation. Ultimately, this work seeks to establish PHD2-targeting PROTACs as a new therapeutic modality in oncology and provide proof-of-concept for targeted degradation of oxygen-sensing enzymes as a strategy for cancer treatment.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS015
Project title:	**Characterisation of non-neuronal cells in the X-linked Dystonia Parkinsonism human globus pallidus**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Dr Adelie Tan (Primary Supervisor) Meikyla Mason Dr Malvindar Singh-Bains
Contact details	adelie.tan@auckland.ac.nz
Skills Needed	• Critical thinking skills • Proficient in Microsoft Office • Good communication • Basic understanding of neuroscience • Excellent time management

Project description

X-linked Dystonia Parkinsonism (XDP) is a hereditary neurodegenerative movement disorder which typically manifests between 30 to 40 years of age, with no available disease-modifying treatments. Typically, XDP symptoms consist of dystonic features, which can combine with parkinsonian features. XDP is considered a basal ganglia disease, with current research emphasising pronounced degeneration of the striatum, the primary input nucleus of the basal ganglia. Our laboratory is studying the involvement of neuronal cells within key basal ganglia structures in this disease. However, emerging evidence suggests that other cell types within the basal ganglia are involved in XDP neurodegeneration. This study will be among the first in the world to profile non-neuronal cell involvement in a core relay structure of the basal ganglia, the globus pallidus. This project involves studying human brain tissue bequeathed by XDP patients as part of a unique international collaboration with the Philippines, USA, and NZ. We will use fluorescent immunohistochemical techniques to profile key markers of non-neuronal cells in human globus pallidus sections from XDP and control cases. We are looking for a dynamic student, is interested in further post-graduate studies, to join our team and push the frontiers in the neuroanatomical understanding of neurogenetic human movement disorders.

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2026/2027 Projects (Biomedical)

Project code:	MHS016
Project title:	**Understanding the impacts of congenital heart disease on in-utero brain development**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Dr Anna Boss (Primary Supervisor) Dr Teena Gamage Professor Jo James
Contact details	a.boss@auckland.ac.nz
Skills Needed	• All training will be provided for this project. • Prior experience with immunohistochemistry and the use of image analysis software would be advantageous.

Project description

Congenital heart defects (CHDs) are the most common fetal malformations, affecting approximately 1% of births worldwide. These conditions compromise
vascular function and cerebral oxygen delivery, contributing to brain injury and long-term neurodevelopmental impairments. Although many of these neurological abnormalities originate during fetal life, the precise timing and underlying cellular mechanisms remain poorly understood, largely due to technical and ethical constraints associated with studying human development in utero.

Animal models provide a powerful platform to overcome these limitations by enabling controlled investigation of complex fetal developmental processes. The Pregnancy Modelling Group has established a murine CHD model that closely replicates key features of human disease, including ventricular hypertrophy and altered ventricular geometry.

This project aims to extend the use of this model to the developing brain by analysing fetal brain tissue from the same cohort of animals. Using immunohistochemical approaches, neuronal and vascular cell populations will be labelled in intact fetal brains and visualised using light-sheet microscopy. Quantitative and spatial comparisons between control and CHD-affected brains will be performed to identify how disrupted cardiac formation influences brain development.

By defining the timing and cellular basis of CHD-associated brain alterations, this research will provide crucial insights into the mechanisms linking cardiac dysfunction and neurodevelopment. Ultimately, these findings will inform strategies to mitigate neurological injury and improve long-term outcomes, delivering significant benefits for affected individuals and broader societal and economic wellbeing.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS017
Project title:	**Neuroanatomical underpinnings of cerebellar pathology in X-linked dystonia parkinsonism**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Dr Malvindar Singh-Bains (Primary Supervisor) Dr Adelie Tan
Contact details	m.singh-bains@auckland.ac.nz
Skills Needed	• Good communicator • Proficient in Microsoft Office • Attention to detail • Problem-solving skills • Team player

Project description

X-linked Dystonia Parkinsonism (XDP) is a hereditary neurodegenerative movement disorder characterised by debilitating dystonic and parkinsonian features, for which no disease-modifying treatments currently exist. While traditionally categorised as a basal ganglia disease defined by striatal degeneration, emerging clinical and neuroimaging evidence suggests that pathophysiology extends beyond these boundaries. Specifically, the cerebellum's role in XDP pathogenesis remains poorly understood, despite its critical position in the broader motor network of the human brain. This project aims to elucidate whether the main efferent neurons, Purkinje cells, and the surrounding support glial population are impacted in XDP cerebellar pathology. Utilising human post-mortem brain tissue obtained through a unique international collaboration between the Philippines, USA, and NZ, the student will investigate the structural integrity of the XDP neocerebellum. We will employ fluorescent immunohistochemical techniques to profile key neuronal markers, as well as specific markers of astrogliosis and microglial reactivity, in XDP and neurologically normal tissue sections. We are seeking a motivated student interested in postgraduate research to join our team. This project offers an exceptional opportunity to master advanced neuroanatomical techniques and contribute to groundbreaking research that redefines our understanding of XDP disease progression.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS018
Project title:	**Sugar rush! Examining the therapeutic potential of nitrate supplementation on brain blood flow control following sugar consumption**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Dr Mickey Fan (Primary Supervisor) Prof. James Fisher
Contact details	mickey.fan@auckland.ac.nz
Skills Needed	• Successful applicants will be assisting in human physiological studies • They will be involved in participant recruitment, data collection and data analysis. • Good people skills is ideal!

Project description

Adults with type 2 diabetes are at significantly higher risk of stroke and dementia. This is due to the high blood sugar levels, which damages the blood vessels and lowers blood flow to the brain. We recently found that supplementing nitrate in our diet enhances the blood vessel function, and may protect the brain against high levels of blood sugar. This summer studentship project will examine the therapeutic potential of sodium nitrate supplementation on brain blood flow control in healthy individuals following consumption of a sugary drink. This research could let to a novel, and affordable way to protect the brain and reduce the risk of stroke and dementia in individuals living with diabetes.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS019
Project title:	**Clearing the Mind: the impact of hypertension and diabetes on brain waste clearance**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Fiona McBryde (Primary Supervisor) Tonja Emans
Contact details	f.mcbryde@auckland.ac.nz
Skills Needed	• You will learn the following skills: • *being part of a team in the lab • *analysis and presentation of physiological and histological data • *oral communication of your project to an audience

Project description

This summer project will explore how chronic cardiovascular conditions such as hypertension and diabetes can impact cerebrovascular control and impair the brain's waste clearance pathways. We hypothesize that these conditions disrupt arterial pulsatility through impacts on vascular compliance, which we hypothesize compromises the movement of cerebrospinal fluid along perivascular "glymphatic" pathways, making it harder for the brain to rid itself of waste.

The cerebrovascular control lab are a friendly and supportive team, who have a lot of fun doing some really exciting science!

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS020
Project title:	**Visualising cell volume protein modifications in diabetic cataract**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Gus Grey (Primary Supervisor) George Guo Rosica Petrova
Contact details	ac.grey@auckland.ac.nz
Skills Needed	• immunohistochemistry • proteomics • scientific writing • tissue dissection • microscopy • digital image analysis

Project description

Lens cataract is the most common cause of blindness globally, with 35 million people visually impaired due to cataract. Diabetics have a high incidence of cortical cataract which develops several years earlier than the general population. In Aotearoa New Zealand, approximately 320,000 people live with diabetes, which is characterised by poor blood glucose regulation due to deficient insulin signalling. This leads to osmotic and oxidative stress that results in localised disruption of the ordered cell structure in the lens cortex and manifests as diabetic cataract damage phenotype. We hypothesise that this damage is caused by pathological modification of cell volume regulatory proteins present in the cell membranes of lens cells. This project will apply immunohistochemical and proteomic approaches to map these modifications to cell volume regulatory proteins in normal and cataractous human lens tissue.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS021
Project title:	**Does spontaneous prolonged hypoxia exacerbate brain injury after acute hypoxia-ischemia in near-term fetal sheep?**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Joanne Davidson (Primary Supervisor) Alice McDouall
Contact details	joanne.davidson@auckland.ac.nz
Skills Needed	• Some understanding of neuroscience and perinatal brain injury preferred.

Project description

Oxygen deprivation around the time of birth can lead to brain injury in infants, known as hypoxic-ischemic encephalopathy (HIE). Currently, the only approved treatment is therapeutic hypothermia (mild cooling), which significantly improved the rate of death and disability in infants with HIE in high-income countries. However, a large randomised controlled trial in low-to-middle income countries showed that hypothermia was not effective, and worryingly, hypothermia increased the rate of death in cooled infants. In part, this could be due to babies from low-to-middle income countries having been exposed to prolonged hypoxia-ischemia before birth and/or during labour, as opposed to acute hypoxia-ischemia at the time of birth. The aim of this project is to compare brain damage as a result of acute hypoxia-ischemia in term equivalent sheep fetuses that have been exposed to spontaneous prolonged hypoxia, versus those with normal oxygenation. This research may help us to better understand how brain injury occurs in fetuses exposed to prolonged hypoxia in utero and how best to treat them.
Skills learned during studentship:

- Immunohistochemistry
- Microscopy
- Cell counting
- Image analysis
- Statistical analysis
- Figure preparation for publication

There is also potential honours projects available in our lab group.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS022
Project title:	**Examining zinc links in autism in human cells**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Johanna Montgomery (Primary Supervisor)
Contact details	jm.montgomery@auckland.ac.nz
Skills Needed	• Interest in neuroscience research • Completion of undergraduate neuroscience courses e.g. Medsci 206, Medsci 317 • Some knowledge or experience in cell culture

Project description

The SHANK family of proteins are critical for synapse function in the brain, and variants in the SHANK3 gene are known to cause Phelan McDermid Syndrome (PMD) and severe cases of autism. We have previously shown that dietary zinc in rodent models can reverse behavioural deficits in PMD and autism. We are now advancing this work into human cells, where we grow mature neurons from blood samples from patients and health related controls. In this project the student will take part in growing these cells and examining how zinc treatment alters their function. Techniques used include cell culture, immunocytochemistry, and microscopy.

Faculty of Medical and Health Sciences
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2026/2027 Projects (Biomedical)

Project code:	MHS023
Project title:	**Molecular genetics of lymphatic vessel growth**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Jonathan Astin (Primary Supervisor)
Contact details	j.astin@auckland.ac.nz
Skills Needed	• Model organism genetics • Live cell imaging • Zebrafish husbandry • CRISPR/Cas9 gene knockout

Project description

The lymphatic vasculature is essential for fluid homeostasis in the body. When lymphatic vessels are obstructed or damaged this results in lymphoedema, the painful and debilitating accumulation of lymph in tissues. Secondary lymphoedema is one of the most significant survivorship issues following surgical and/or radiological treatment for tumours and is caused by incomplete lymphatic growth following lymph node removal.

Almost nothing is known about how lymphatic growth is regulated. To help further our knowledge of this process, we have isolated mutant zebrafish that display either undergrowth or overgrowth of lymphatic vessels. This project will help characterise these lymphatic mutants to uncover the genetics that control lymphatic vessel growth.

Experiments could involve:

1)Imaging lymphatic vessel growth in mutant fish.

2)Mapping genetic mutants to find causative mutations.

3)Experiments focused on the validation of candidate mutations i.e. CRISPR/Cas9, gene knockdowns, gene over-expression.

References:

Chen W, Misa JP, Herbert CD, ... Astin JW. Insulin-like growth factor signalling regulates zebrafish lymphatic vessel development. Cell Reports 2026. Feb 13;45(2):116971.

Britto DD, He J, Misa JP, ... Astin JW. Plexin D1 negatively regulates zebrafish lymphatic development. Development. 2022 Nov 1;149(21):dev200560. doi: 10.1242/dev.200560.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS024
Project title:	**Autonomic Control and Cardiovascular Health in Menopause: Characterising a new large animal model**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Julia Shanks (Primary Supervisor)
Contact details	julia.shanks@auckland.ac.nz
Skills Needed	Skills required • Analysis of data • Oral presentation skills • Literature review writing skills • Understanding of integrative physiology

Project description

The incidence of hypertension and related cardiovascular complications rises significantly in women following menopause. While traditional research focuses heavily on peripheral vascular changes, changes within the autonomic nervous system, which controls heart rate and blood pressure, play a major role in this transition.

This summer project focuses on the validation and physiological characterisation of a newly established ovariectomised (Ovx) sheep model designed to study post-menopausal cardiovascular control. The student will analyse long-term, conscious hemodynamic data to map out baseline changes in blood pressure, heart rate, and autonomic parameters following the loss of ovarian hormones. Additionally, the student will measure plasma biomarkers, and use basic histological techniques to evaluate cellular and structural changes.

This project provides an excellent opportunity to gain experience in both physiological data analysis and wet-lab tissue processing, making it ideal for a student looking to pursue Honours or Master's studies in physiology or biomedical science.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS025
Project title:	**Light detection in the lens**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Julie Lim (Primary Supervisor) Yadi Chen
Contact details	j.lim@auckland.ac.nz
Skills Needed	• Attention to detail • Can work as part of a team • Comfortable doing animal eye dissections

Project description

Recently, our group has identified the presence of the light-sensitive protein melanopsin in the lens. This finding is particularly interesting, as the traditional view is that light information is conveyed to the lens indirectly via the retina and brain. We hypothesise that the lens can directly detect light, and that this capability plays an important role in regulating antioxidant levels within the lens. Such regulation may help protect the lens against oxidative stress and the development of cataracts. This project will involve characterisation of melanopsin in the lens, as well as the investigation of other potential opsins that may contribute to light detection in this tissue.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS026
Project title:	**Nitric Oxide Donor–Drug Conjugates for Cancer Treatment**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Leon Lu (Primary Supervisor) Petr Tomek
Contact details	gl.lu@auckland.ac.nz
Skills Needed	• Preference will be given to candidates with some experience in organic or organometallic synthesis.

Project description

Many anticancer agents, including platinum-based chemotherapies and small-molecule kinase inhibitors, play essential roles in cancer treatment. However, their clinical effectiveness is often limited by severe side effects and the development of drug resistance, which is frequently associated with elevated glutathione (GSH) levels in tumour cells. This project aims to address these challenges by developing innovative nitric oxide (NO) donor–drug conjugate prodrugs that can be selectively activated in the high-GSH tumour microenvironment. The controlled release of both NO and the anticancer drug within tumour cells has the potential to enhance therapeutic efficacy, overcome resistance, and improve tumour selectivity while minimising damage to healthy tissues.

This summer research project will focus on the synthesis of nitric oxide (NO) donor–drug conjugates for cancer treatment. The student will receive comprehensive training in medicinal chemistry and drug development, including drug design, literature searching using scientific databases (e.g. SciFinder and Reaxys), scientific writing, organic synthesis, compound purification techniques (e.g. chromatography and HPLC), structural characterisation (e.g. NMR and MS), as well as drug assay and evaluation.

The Auckland Cancer Society Research Centre (Department of Cancer Sciences) provides a highly collaborative and multidisciplinary research environment with access to modern research facilities and expert supervision.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS027
Project title:	**Reactive by Design: Building Precision Covalent Inhibitors**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Lydia Liew (Primary Supervisor) Associate Professor Stephen Jamieson Dr Daniel Conole
Contact details	l.liew@auckland.ac.nz
Skills Needed	• Foundation in organic or medicinal chemistry (reaction mechanisms, functional groups, and synthesis) • Basic laboratory skills (e.g. weighing, solution preparation, safe lab practice) • Familiarity with compound characterisation (NMR, MS, IR) • An interest in m

Project description

Covalent inhibitors engage their target proteins through a two-step process. First, reversible binding positions the inhibitor within the protein's active site. This step is governed by binding affinity and driven by non-covalent interactions (e.g. hydrogen bonding and van der Waals forces) which align the inhibitor near a reactive residue.

In the second step, a covalent bond is formed. This reaction depends on electronic complementarity between the inhibitor and the target: the inhibitor acts as an electron acceptor, while the protein residue donates an electron pair to form the new bond.

Our group is developing covalent inhibitors that selectively target a tyrosine residue on the protein SHOC2. Achieving this selectivity requires careful tuning of both non-covalent interactions (for positioning) and electronic properties (for reactivity).

In this project, you will explore the reactivity of tyrosine residue(s) on SHOC2 by designing and synthesising a series of aryl fluorosulfate probes. Starting from variably substituted phenols, you will:

- model and rationalise their electronic properties
- synthesise, purify and characterise the target compounds
- explore the reactivity of the probes (stretch goal)

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS028
Project title:	**Morphological adaptations as a key to understand mechanisms of hypoxia tolerance in marine mammals**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Miriam Scadeng (Primary Supervisor) David Dubowitz
Contact details	M.scadeng@auckland.ac.nz
Skills Needed	• The project is computer-based. • Segmentation of 3D imaging data will be done using Amira software. The student will be taught how to use the software. • The data analysis will be using various software programs. The student will be taught how to u

Project description

The student will be segmenting electron microscopy data or magnetic resonance imaging data of tissue from hypoxia-tolerant species such as elephant seals and other marine animals. The aim is to determine the size and shape of mitochondria or other structures, to determine how size and shape facilitate the mechanisms supporting hypoxia tolerance in tissues.

- This study is done in collaboration with the University of California, San Diego.
- There will be an opportunity to have authorship on manuscripts you contribute to and potentially presentations.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS029
Project title:	**Monitoring the effects of a novel pacemaker on cardiac function and exercise capacity**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Mridula Pachen (Primary Supervisor) Rohit Ramchandra
Contact details	m.pachen@auckland.ac.nz
Skills Needed	• Strong initiative, enthusiasm, and a willingness to learn • Commitment to hard work and attention to detail • Interest in cardiovascular physiology and translational research • Ability to work independently as well as part of a team • Preference will be

Project description

Respiratory heart rate variability (RespHRV) pacing is a novel approach that synchronizes cardiac pacing with breathing. Our recent work demonstrated that RespHRV pacing improves exercise tolerance and cardiac function in a sheep model of heart failure. This project builds on this clinically relevant finding by investigating whether these physiological benefits translate into improved long-term physical activity in freely moving animals.

This project investigates how our novel pacemaker which restores RespHRV affects long-term physical activity in sheep using advanced GPS tracking technology. Data will be collected in animals post chronic heart failure and both non-paced and paced states will be monitored over a 5-month period.

Students will work with high-resolution movement data collected 24 hours a day, including distance travelled, acceleration, paddock area coverage, and time spent active versus resting. A key focus of this project will be comparing activity levels within the same animal during non-paced and paced periods to estimate exercise capacity.

In addition, echocardiography will be performed monthly to assess cardiac function. Student will participate in analyzing echocardiographic data to quantify changes in heart function over time.

This project provides hands-on experience in cardiovascular physiology, wearable sensor technology, and data analysis in a translational large-animal research environment.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS030
Project title:	**Effects of age on antioxidant levels in bovine models of lens cataract**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Paul Donaldson (Primary Supervisor) Julie Lim
Contact details	p.donaldson@auckland.ac.nz
Skills Needed	• Bovine lens dissection • Biochemical assays • Mass spectrometry • Accuracy and good record keeping

Project description

With age the normally robust antioxidant capacity of the lens becomes compromised, causing oxidative damage to key proteins that ultimately manifests as age-related nuclear (ARN) cataract. To mimic this process in the laboratory The Molecular Vision Research Cluster (MVRC) has exposed bovine lens to high levels of oxidative stress (hyperbaric oxygen and/or UV light) to mimic the chronic exposure that human lenses experience over many decades of life. Previously this work utilised bovine lenses from young animals which have higher levels of antioxidants and as such are more resistant to the oxidative stress. More recently, we have obtained access to a supply of older animals which we hypothesize will have lower antioxidant reserves and hence will be more susceptible to developing cataract in response to the oxidative stresses we apply to them. The successful applicant will help test this hypothesis by using established biochemical and mass spectrometry-based assays to measure oxidative stress markers and antioxidant deletion in older bovine lenses exposed to hyperbaric oxygen and/or UV light. The development of an improved laboratory based animal model that mimics the onset of ARN cataract will greatly enhance the efforts of the MVRC to develop novel therapies designed delay the onset of lens cataract.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS031
Project title:	**The immune system strikes back: Dissecting and sabotaging cancer's immunoregulatory metabolic networks for enhanced immunotherapy and diagnosis**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Petr Tomek (Primary Supervisor)
Contact details	p.tomek@auckland.ac.nz
Skills Needed	• excellent English communication • technical aptitude, meticulous attention to detail • enthusiasm for investigation and problem solving • inquisitive and proactive Preference may be given to applicants who: • consider doing research as a career

Project description

The human immune system can seek out and destroy tumour cells with surgical precision. That is why most people never get cancer. But some tumour cells evolve to evade immune cell killing which leads to malignant cancer. Many cancers achieve this by overexpressing saboteur genes that stimulate production of tryptophan metabolites. These metabolites weaken cancer-killing immune cells and undermine curative immunotherapies.

This project contributes to a cutting-edge translational immunometabolism ecosystem combining i) discovery of regulatory networks and producers of cancer-associated metabolites as drug/diagnostic targets, and development of ii) a new frontier in metabolic medicine and iii) in-human metabolism imaging. Ultimately, this platform aims to enable early cancer diagnosis and prevention, sensitise patients to immunotherapy, monitor and predict therapeutic outcomes.

I look forward to talking to anyone keen on exploring this fascinating area blending genomics, gene editing, proteomics, drug development, metabolism, chemical and molecular biology.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS032
Project title:	**Mitochondrial dysfunction and delayed treatment of preterm brain dysmaturation**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Justin Dean (Primary Supervisor) Petra White
Contact details	j.dean@auckland.ac.nz
Skills Needed	• Undergraduate laboratory experience. • Interest in microscopy.

Project description

Preterm birth is a leading indicator of a nation's health, as it is associated with high mortality and serious morbidity. In NZ, ~500 babies are born very preterm (<32 weeks') annually. These infants exhibit high rates of brain injury/disability, of which a major cause is exposure to postnatal infection/inflammation. Regardless, there are no effective treatments to prevent or reduce brain injury in these vulnerable babies. A central challenge for clinical translation of any neuroprotective intervention is that diagnosis is often delayed. Further, the timing of brain injury is particularly unclear in preterm infants, while the clinical manifestation of injury may not be apparent for months to years later. Thus, it is vital to develop therapies with longer windows of opportunity to provide neuroprotection and to support long-term neurorepair.
Mitochondria are essential for cellular energy production and regulate many aspects of brain development. Studies in our laboratory indicate a systemic inflammation in newborn rats is associated with persisting deficits in neuronal mitochondrial structure and cortical function in which is repaired with delayed treatment with n-acetylcysteine). This project aims to determine if there are persisting alterations in mitochondrial structure in cortical glia following postnatal inflammation and the effects of delayed NAC treatment.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS033
Project title:	**Evaluating a library of photorealistic 3D images of human organs: Perspectives from students, teaching and clinical staff**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Rachelle Singleton (Primary Supervisor) Komal Srinivasa Zoe Woolf Amanda Charlton Deborah Prendergast
Contact details	r.singleton@auckland.ac.nz
Skills Needed	• Quantitative data (numerical) analysis skills, simple statistics • Qualitative data (text responses) interpretation skills, thematic analysis • Teamwork • Problem-solving • Comfortable handling data, human organs and tissues

Project description

Background: At FMHS we are building a library of photorealistic 3D images of human organs. This educational resource will enable interactive online and blended learning experiences in anatomy and pathology. In 2025 we did a pilot evaluation, this preliminary data needs expanding and analysis.
Objective: To further evaluate the 3D image library with FMHS students and teaching staff, pathology registrars and clinicians. We need more user feedback on the model quality and accuracy, educational value, usability and accessibility, barriers and suggestions.
Methods and skill required: You will distribute an existing survey, analyse the quantitative data (numerical) using simple statistics; and qualitative data (text responses) using thematic analysis. Working with another student you will create more 3D images. You will be proactive in problem-solving, comfortable handling data, human organs and tissues. You will be working in a team environment with another summer student on a complimentary project
Research impact: You will expand and improve the quality of our 3D image library for education. This has relevance in current resource constrained environments, improving access to all health professions students including those without access to cadavers.
Skills learnt: Teamwork, survey implementation, data analysis, 3D photogrammetry, human anatomy and pathology.

Project code:	MHS034
Project title:	**Hypertension: A modifiable risk factor in aortic dissection**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Ryan Sixtus (Primary Supervisor) James Fisher

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

	Nishith Patel
Contact details	ryan.sixtus@auckland.ac.nz
Skills Needed	• Interest/experience of working with human volunteers in a research setting • Interest/experience of collecting physiological data from human volunteers • Interest/experience of analyse physiological data using excel, R, SPSS, etc • Ability to work well

Project description

Aortic dissection is a severe and highly fatal medical emergency caused by a tear in the arterial wall. Hypertension is the most prevalent risk factor for aortic dissection, and reducing blood pressure following dissection is the greatest determinant of survival. However, survivors have high rates of resistant hypertension (blood pressure >140/90 mmHg despite taking >4 antihypertensive medications) and other markers which indicate sympathetic overactivity. We aim to understand the neurogenic mechanisms underlying hypertension in survivors of aortic dissection. We are currently recruiting survivors of aortic dissection and those at-risk of experiencing aortic dissection.

During the 10-week Summer Research Scholarship you will assist with recruitment and testing of aortic dissection patients. This will involve guiding the participants through the informed consent process, familiarising volunteers to the laboratory, collecting data in the laboratory, analysing physiological data and preparing figures/tables and presentations. Full training will be provided.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS035
Project title:	**Characterising abnormal brain motion in amplified MRI**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Samantha Holdsworth (Primary Supervisor) Dr Eryn Kwon, Dr Maryam Tayebi
Contact details	s.holdsworth@auckland.ac.nz
Skills Needed	• This project will provide training in: • Interpretation of amplified MRI (aMRI) brain motion data • Statistical analysis using tools such as Python, MATLAB, or R • Inter-rater reliability analysis (e.g., Cohen’s kappa, ICC) • Scientific writing and figure prepar

Project description

Amplified MRI (aMRI) is an emerging imaging technique that enables subtle brain motion to be visualised and characterised. In a recent study of 105 participants aged 18–91 years, a subset of individuals demonstrated brain motion patterns that differed from those typically observed in previous aMRI studies. These differences were identified as “abnormal” brain motion patterns.

To investigate these findings, a reader study was established in which five trained readers classified aMRI videos as showing either normal or abnormal motion using a set of qualitative assessment criteria developed by the research team.

This summer internship project will focus on transforming the existing reader study into a publishable scientific manuscript. The intern will contribute to analysing reader performance, refining classification criteria, interpreting motion patterns, and preparing figures and written content for publication. The project provides an opportunity to work at the intersection of advanced neuroimaging, data analysis, and scientific communication within an international collaboration between University of Auckland, Mātai Medical Research Institute and Stanford University.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS036
Project title:	**Investigating a new treatment for preterm babies with brain injury**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Simerdeep Dhillon (Primary Supervisor)
Contact details	s.dhillon@auckland.ac.nz
Skills Needed	• This project requires background of physiology.

Project description

About 8% of babies born in New Zealand arrive prematurely each year. These children face a significant risk of lifelong challenges – such as learning difficulties, lower IQ and behavioural issues – due to brain injury and impaired development. One major cause of this is low oxygen levels in the womb or during birth.

Right now, there are no treatments to protect these tiny brains. Importantly, spotting brain injury in preterm babies is difficult and can take time to diagnose. To really make a difference, we need treatments that can be given following birth, even after a very long delay. Dr Simerdeep Dhillon is leading a study to determine whether a commonly used drug (Exenatide) can help reduce inflammation and repair the preterm brain after oxygen-deprivation injury.

This summer research project will compare the efficacy of early and delayed treatment protocols to attenuate white matter damage after oxygen-deprivation injury and establish a window of therapeutic intervention. In the process, the student will master highly transferable skills including immunohistochemistry, microscopy, image analysis, cell quantification and statistical analysis. If successful, this research could pave the way for future studies that might reduce disabilities and improve outcomes for preterm infants.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS037
Project title:	**Characterising canine spinal cord injury as a model for SCI clinical trails**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Simon O'Carroll (Primary Supervisor)
Contact details	s.ocarroll@auckland.ac.nz
Skills Needed	• Immunohistochemistry • Microscopy • Image analysis • Data analysis (Excel, Prism)

Project description

Similar to humans, dogs commonly present to veterinary practices having suffered a spinal cord injury. Like in humans this involves a mixed compressive/ contusive injury and causes a spectrum of neurological deficits, which can be permanent. Because they share similar spinal anatomy, biomechanics, and naturally occurring injury types with humans, canine models can bridge the critical gap between early rodent research and human clinical trials. Compared to humans, little research has been undertaken into the histopathological features of canine SCI leaving large gaps in the understanding of the pathophysiology of the disease. Evidence in humans has shown the importance of glial cells and the immune system in the pathophysiology of spinal cord injury and it is likely that this is true in dogs also.

Therefore, the aims of this project are to 1) begin to further characterise histopathologically the role of glial and inflammatory cells in canine spinal cord injury and 2) compare the histopathological features of canine spinal cord injury to previously published features of human spinal cord injury and to begin to assess the utility of using canine spinal cord injury as a naturally occurring model of human spinal cord injury.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS038
Project title:	**The antimicrobial potential of Harakeke pia**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Simon Swift (Primary Supervisor) Joyce Campbell
Contact details	s.swift@auckland.ac.nz
Skills Needed	• Interest in some of the following: microbiology, microscopy, natural products, material testing

Project description

Harakeke (Phormium tenax) has been propagated in Wairoa for a thousand years. Wairoa's commercial flax industry was decimated by the invention of synthetic fibre, which threatens ecosystems planet-wide. Our UoA and Wairoa based team is researching harakeke for a number of applications. In this project we plan to assess the antimicrobial potential of Harakeke pia (gum) and relate this to composition and material properties. Methods will comply with tikanga and support environmental stewardship and development of a research hub in Wairoa.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS039
Project title:	**Breathing New Life into Failing Hearts: Developing a Novel Method to Isolate Sheep Cardiomyocytes**
Discipline:	Biomedical - School of Medical Sciences
Supervisor(s)	Xin Shen (Primary Supervisor) Julian Paton Rohit Ramchandra
Contact details	xin.shen@auckland.ac.nz
Skills Needed	• Basic laboratory skills including pipetting, preparing buffers.

Project description

Heart failure is a major health challenge affecting thousands of people in Aotearoa NZ and remains a leading cause of hospitalisation. While current treatments can slow disease progression, they do not repair damaged heart tissue. Our group has identified a new approach based on restoring natural beat-to-beat changes in heart rhythm associated with breathing, known as Respiratory Heart Rate Variability (RHRV). Using a novel pacemaker, we have shown that restoring RHRV dramatically improves heart function and promotes repair of damaged cardiomyocytes in sheep models of heart failure.

By understanding how RHRV restores function at the level of individual cardiomyocytes, we lay the groundwork for new drug treatments that could reproduce the benefits of the pacemaker approach without requiring an implanted device. However, progress has been limited by the absence of established protocols for isolating sheep cardiomyocytes. This summer project aims to develop and optimise a novel method for isolating ventricular cardiomyocytes from sheep hearts. Cardiac tissue will be thinly sliced and enzymatically digested to isolate cells. Cell quality, structure, and function will then be assessed using immunofluorescence microscopy and live-cell imaging. Once established, this platform enables testing of different pacing protocols to investigate how RHRV influences cardiomyocyte structure and function.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS040
Project title:	**Validating the electrostatic signatures of waggle dances in honey bee hives**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	Guy Warman (Primary Supervisor) Dr James Cheeseman
Contact details	g.warman@auckland.ac.nz
Skills Needed	• an interest in the analysis of high temporal resolution data • interest in electrostatic field measurement (eg EEG) to understand behavioiur • This project is open to science students from any background and would be of particular relevance to students intere

Project description

Our understanding of how the honey bee clock functions remains limited - largely because direct observation requires opening the hive which disrupts behaviour.

We have developed a novel high-resolution electrostatic field (ESF) sensor system (BeeSpy) that allows us to non-invasively monitor bee behaviour inside closed hives.

This project will focus on validating ESF signals of waggle dancing bees against video footage recorded from observation hives. You will collect and analyse concurrent video and ESF recordings of waggle dances, and use AI-based systems to identify characteristic ESF signatures. These signatures will then be used to identify waggle dances in undisturbed hives.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS041
Project title:	**Unraveling the role of the lens in normal visual development and myopia**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	Wilson Pan (Primary Supervisor) Paul Donaldson
Contact details	x.pan@auckland.ac.nz
Skills Needed	• interest in vision science or optics • interst in understanding how optics of the eye develop • interest in learning image processing and data analysis • useful to have experience with writing reports and putting together figures • be organised and have a g

Project description

This project will be part of a pipeline of experiments that test how to development of the ocular lens optical power coincides with a growing eye of the zebrafish. We also test how this relationship is perturbed in a myopia model developed at UoA. The focus of this studentship will be to organise the high resolution refractive index data of analysed zebrafish lenses with the existing eye anatomy images, and organise them into figures for a publication.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS042
Project title:	**Alterations in the heart-placenta axis in fetal growth restriction - quantifying anatomy to understand function.**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	Jo James (Primary Supervisor) Dr Teena Gamage
Contact details	j.james@auckland.ac.nz
Skills Needed	• All training will be provided for this project. • Prior experience with immunohistochemistry and the use of image analysis software would be advantageous.

Project description

The placenta is a fetal organ critical for growth and development in-utero. When placental formation/function is compromised, fetal growth restriction (FGR) can arise. In FGR, the fetus fails to achieve its growth potential, which can be life-threatening.

We have used a murine model of FGR to demonstrate that, at term (embryonic day E18.5), FGR placentae have reduced vascular development compared to healthy controls, which in-silico modelling predicts increases placental vascular resistance. Concurrently, mirroring human FGR, the fetal heart exhibits changes in the left ventricle that pushes against this increased placental resistance. Building on these findings, we aim to look earlier in gestation to determine the developmental onset of these abnormalities and better understand how the interplay between the heart and placenta develops across pregnancy.

This project will address this aim by quantifying differences in the placental vasculature across pregnancy in our murine model. Stereological techniques will quantitatively assess the placental vasculature at E12.5 and E16.5, to determine when vascular deficits first emerge.

Findings will be integrated into a computational models that relate placental structure to function, and in turn to parallel data from fetal hearts of the same animals, providing deeper insight into normal and compromised in-utero development.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS043
Project title:	**B3a – a new approach to antimicrobial resistance**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	Kristi Biswas (Primary Supervisor) Raquel Gambarini
Contact details	k.biswas@auckland.ac.nz
Skills Needed	• Basic microbiology laboratory skills (or willingness to learn) • Aseptic technique (or willingness to learn) • Disk diffusion assay (will be taught) • Data recording and basic analysis • Attention to detail and careful experimental technique • Adherence

Project description

Antimicrobial resistance (AMR) is one of the most pressing global health threats, with over one million deaths attributed to resistant infections each year. Our laboratory is developing B3a, a novel topical antimicrobial compound with potent activity against clinically relevant pathogens. Notably, serial passaging experiments show no meaningful change in B3a susceptibility over time, suggesting a low propensity for resistance development compared to conventional antibiotics such as mupirocin.

A key question before B3a can advance in development is whether bacteria exposed to it show any change in susceptibility to existing antibiotics — a phenomenon known as cross-resistance. In this project you will investigate exactly that.

You will test bacterial isolates serially passaged in the presence of B3a or comparator antimicrobials against a panel of clinical antibiotics. Techniques will include microbiology in a PC2 lab, working with clinically relevant bacterial strains, and disk diffusion assays. This is a hands-on project offering the opportunity to contribute to an active drug development programme.

This summer studentship can be continued towards honours, master's or PhD studies. If interested, please email your CV and academic transcript, and meet us for a chat about the project.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS044
Project title:	**Antimicrobial effects of therapeutic eye light devices (biomedical)**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	Prof. Jennifer P Cairg (Primary Supervisor) Dr. Sanjay Marasini Catherine Jennings
Contact details	jp.craig@auckland.ac.nz
Skills Needed	• Critical thinking • Good written and verbal communication skills • Team player • Experience in laboratory set-up would be beneficial but not essential

Project description

Ophthalmic clinicians have seen rapid expansion in the availability of light-based devices used to treat eye disorders such as keratitis or anterior blepharitis. This summer research project will investigate relative antimicrobial efficacy of several contemporary light-based devices, in a laboratory-based study. The project will explore the anti-bacterial potential of short-wavelength UVC light, blue light emitted from a commercially available dry eye treatment mask (low level light therapy; LLLT), and intense pulsed light (IPL) relative to established positive and negative controls, in a scientifically study. The study offers students an opportunity to gain hands-on experience in microbiology and experimental laboratory methods while contributing to clinically relevant ocular surface disease research. This novel project would suit students interested in basic science research and translational research.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS045
Project title:	**Mapping the expression of the structurally adhesive MP20 protein during embryonic and postnatal development in the mouse lens**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	Rosica Petrova (Primary Supervisor) Paul Donaldson
Contact details	r.petrova@auckland.ac.nz
Skills Needed	• Fixation of lenses • Cryosectioning of fixed lenses • Immunolabeling • Confocal microscopy

Project description

To stay transparent the lens of the eye relies on a structurally organised fiber cells by restricting the extracellular space to 30nm to remove light diffraction. This is achieved by the expression of MP20 protein which recently has been shown to form head-to-head structural junctions described as a handshake. Interestingly, in the rat and human adult lens, MP20 insert into the membranes of mature fibres cells in the inner regions of the lens which coincides with the restriction of the extracellular space to 11nm thin junctions to maintain lens transparency. To understand how this pattern of localization is established during embryonic and postnatal stages of development mouse lenses will be used as an experimental model. This will be achieved by performing immunolabeling to map the localization of MP20 from the periphery to the core of the lens utilizing cryosections obtained from embryonic stages of lenses at days E12 and E16, early postnatal stages of P1, P3, P6 and P15 and compare to the adult lens at 4 to 6 weeks. This study will shed light on the foundation of the organisation of MP20 expression during early development that directly influence the overall health and growth of the lens.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)

Project code:	MHS046
Project title:	**Umbilical stem cells and corneal wound healing**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	Trevor Sherwin (Primary Supervisor) Salim Ismail
Contact details	t.sherwin@auckland.ac.nz
Skills Needed	• You will learn cell culture, time lapse microscopy and ddPCR. You don't need to be skilled in these techniques as we will teach you but you do need to be a quick learner with enthusiasm for the project.

Project description

We have been able to incorporate human umbilical stem cells into human corneas in our ex vivo model as a potential regenerative treatment. We now wish to learn what response these cells will have to a secondary insult such as trauma. This will inform whether the incorporated cells have the ability to help the cornea heal if the cornea were to suffer another insult

Project code:	MHS047
Project title:	**Decoding Eye Disease with AI and Big Data: Using Machine Learning to Uncover the Hidden Causes of Glaucoma, AMD, and Diabetic Retinopathy**
Discipline:	Biomedical - School of Medicine
Supervisor(s)	William Schierding (Primary Supervisor)
Contact details	w.schierding@auckland.ac.nz
Skills Needed	Skills you will need or are eager to learn: • Python or R coding skills - the languages of data science and AI • Interest in or exposure to machine learning concepts (e.g. scikit-learn, neural networks) • Comfort working with large, real-world datasets • Basi

Project description

Glaucoma, AMD, and diabetic retinopathy are leading causes of irreversible blindness worldwide, and they are only growing more prevalent in our aging population. Breakthroughs in machine learning are now changing what's possible, improving how we understand and interpret disease risk across millions of individuals. This project puts you at the intersection of AI (machine learning), genomics, and public health, using one of the world's most powerful biomedical datasets: the UK Biobank, with health data from over 500,000 people.

You will apply cutting-edge computational tools (predictive modelling, deep learning) to identify who is most at risk of these eye diseases and why. Depending on your interests, you could dive into mining genetic data for disease-linked variants or build risk-prediction algorithms from clinical and lifestyle variables.

This is real research with real-world impact. You will write code, handle messy data, interpret results, and contribute to work that could shape how eye disease is detected and prevented globally. By the end of 10 weeks, you will have built a portfolio-worthy project and gained hands-on experience in the kind of data-driven science that is transforming modern medicine.

Faculty of Medical and Health Sciences
Summer Research Scholarships

2026/2027 Projects (Biomedical)