Student Opportunities

Personalised Medicine Centre

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Start your research journey today

Improve your employment prospects, enhance your research skills or prepare for postgraduate study by undertaking an **Honours, Masters, or Doctorate of Philosophy (PhD)** degree with the Personalised Medicine Centre across multiple disciplines, including biomedical science, molecular science and chemistry.

Our collaborative environment offers access to cutting-edge facilities and a proven history of research excellence.

About the Centre

The Personalised Medicine Centre, formally the Centre for Molecular Medicine and Innovative Therapeutics, is a collaborative research centre between Murdoch University and the Perron Institute, where cutting-edge laboratory research and clinical expertise converge.

Our team of researchers and health professionals, drawn from diverse fields, is united in a shared commitment to advancing personalised medicine - the development of innovative treatments tailored to addressing the specific needs of individual patients, needs that are largely determined by a person's unique genetic makeup and lifestyle.

Our research spans a broad spectrum of critical healthcare challenges. Our diverse research teams are advancing work in areas such as genetic therapies, genomics, motor neurone disease, sepsis, cognitive health, muscular dystrophy, skin integrity and neurodegenerative disorders such as Parkinson's disease, myositis, and multiple sclerosis.

CRICOS Provider Code 00125J | TEQSA Provider ID: PRV12163 (Australian University)

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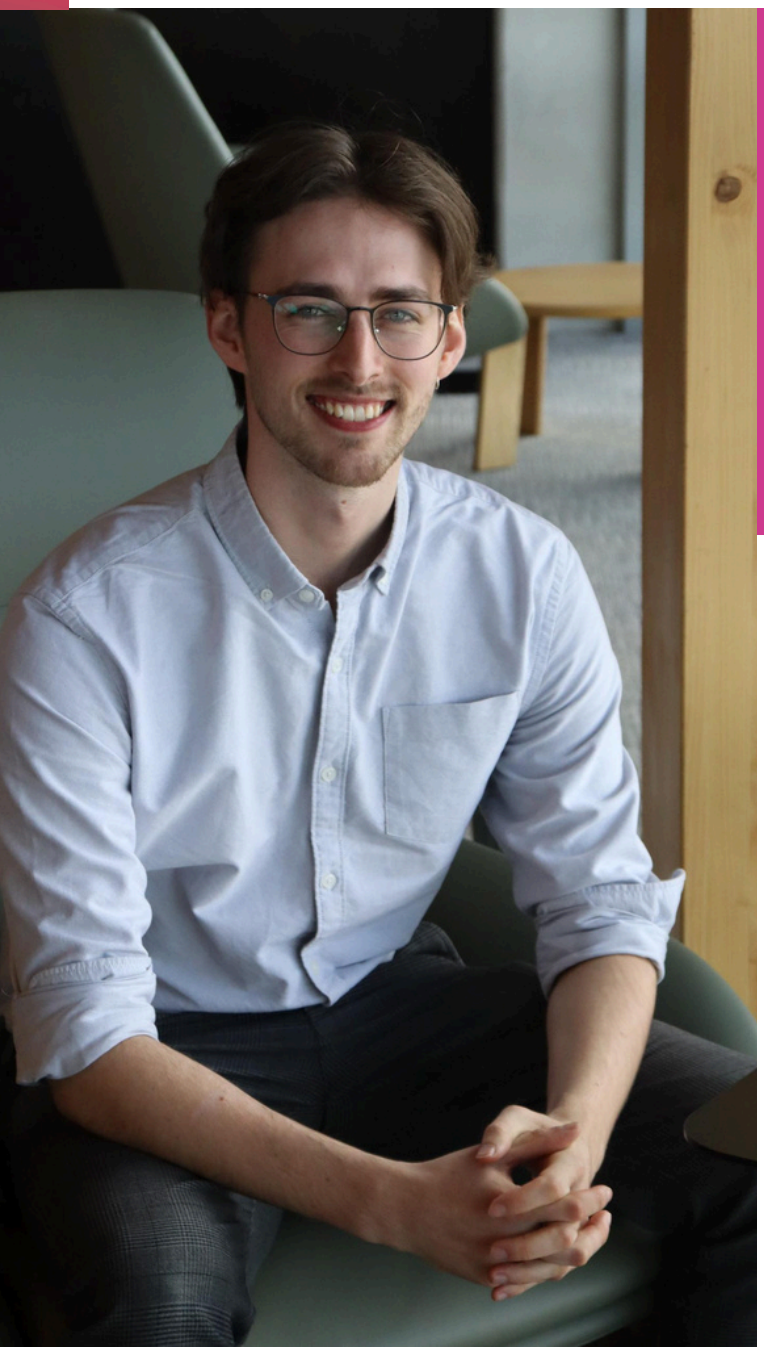

"I chose science because I believe it offers the greatest potential for wide-reaching impact. A single breakthrough can ripple through countless lives, and I realised that was how I wanted to make a difference".

Aidan Murphy, PhD candidate

About our groups

Molecular Therapy Laboratory

Professor Steve Wilton and Dr May Aung-Htut lead a research group that focuses on developing novel therapeutic strategies to treat inherited and acquired human diseases, through the use of genetic drugs (antisense oligonucleotides) to modify gene expression. The team have developed compounds to treat Duchenne muscular dystrophy as well as a range of other rare, and not so rare disorders.

Key contact: moleculartherapy@murdoch.edu.au

Key themes: Antisense Drug Development for inherited & acquired diseases

Motor Neurone Disease Genetics & Therapeutics Research

Professor Anthony Akkari, Dr Loren Flynn and their team are investigating new approaches to the treatment of the fatal motor neurone disease (MND), a disease affecting 350,000 people worldwide.

Key contact: Loren.Flynn@murdoch.edu.au

Key themes: Motor Neurone Disease & ALS

Learn more about studying a Honours, Masters, or Doctorate of Philosophy.

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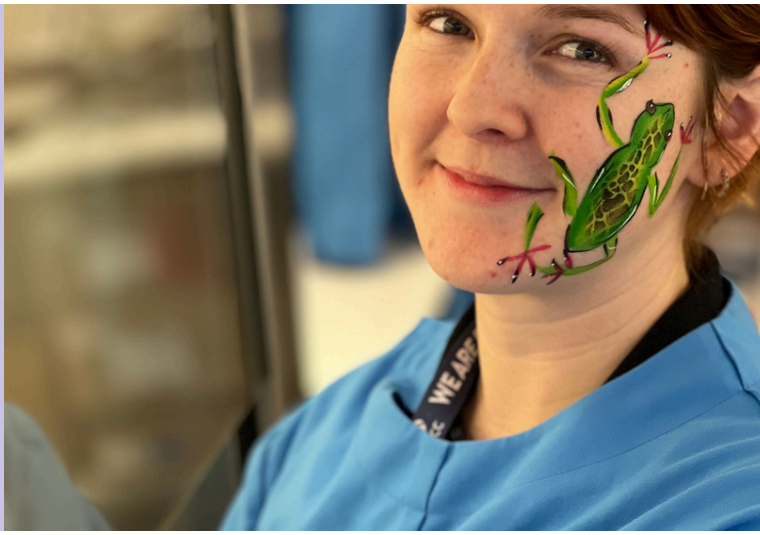
"Studying at the Personalised Medicine Centre enables me to translate cutting-edge science into real-world treatments. We work alongside patient communities to ensure our research delivers hope and innovation where it's needed most."

Caitlyn Vicars, PhD candidate



Oligo Therapeutics
Dr Ianthe Pitout, Emeritus Professor Sue Fletcher and their team develop novel RNA therapeutic strategies for central nervous system disorders.
Key contact: I.Pitout@murdoch.edu.au
Key themes: Inherited blindness & neurodegenerative diseases

Neurodegenerative Diseases
Professor Sulev Kõks and his team aim to probe the genetics and molecular pathology of Parkinson's Disease – with the goal of improving the precision clinical management of patients.
Key contact: Sulev.Koks@murdoch.edu.au
Key themes: Genomics, Neurodegenerative Diseases (inc Parkinson's Disease)

Precision Nucleic Acid Therapeutics
Professor Rakesh Veedu leads the development of novel therapeutic molecules that facilitate target-specific delivery of drugs or diagnostics to disease sites in the body.
Key contact: R.Veedu@murdoch.edu.au
Key themes: Precision Nucleic Acid Therapeutic & Diagnostic Development

Myositis
Professor Merrilee Needham and her team are investigating the treatment, genetics and immuno-pathology of immune-mediated myositis, particularly inclusion body myositis.
Key contact: Nataliya.Slater@murdoch.edu.au
Key themes: Genetics & immuno-pathology of immune-mediated myositis, Clinical Neurorehabilitation & Psychological Resilience

Drug Hypersensitivity
Dr Andrew Gibson and Professor Elizabeth Phillips lead immunogenomics research to identify genetic-, cellular-, and structural-risk factors that will predict and prevent life-threatening immune-mediated drug reactions.
Key contact: Andrew.Gibson@murdoch.edu.au
Key themes: Immunogenomics, Drug Allergy

Medical Genomics
Professor Sulev Kõks team in the centres accredited, high throughput medical genomics facility supports medical and one health researchers locally and across the globe from research concept to market.
Key contact: Sulev.Koks@murdoch.edu.au
Key themes: Genomics

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"My PhD has taught me many valuable qualities, including resilience, perseverance and self encouragement. I've learnt that failure is an opportunity to grow. My advice to other students and young researchers is to remember that after you stumble, get up and try again. Not only in research, but in life."

Dr Di Huang, PhD Graduate

Functional Genomics
Dr Sarah Rea investigates the functional consequences of genetic changes that are associated with neurodegenerative diseases such as ALS and Dementia and aims to identify novel therapeutic strategies to combat these diseases.
Key contact: Sarah.Rea@murdoch.edu.au
Key themes: Neurodegeneration in ALS & Frontotemporal lobar degeneration

Skin Integrity Research Group
Dr Kylie Sandy-Hodgetts research focuses on the clinical prevention and early identification of surgical wound complications such as surgical site infection and surgical wound dehiscence.
Key contact: Kylie.SandyHodgetts@murdoch.edu.au
Key themes: Wound infection & skin integrity

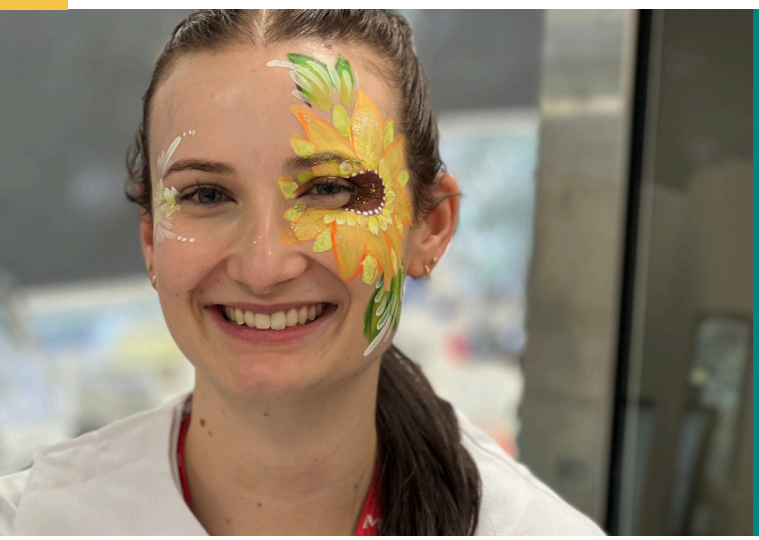
Sepsis Diagnostic Research
Professor Andrew Currie leads a collaborative team of clinicians, veterinarians and medical researchers invested in finding new and better ways to diagnose, treat and prevent sepsis in newborns, adults and companion animals.
Key contact: A.Currie@murdoch.edu.au
Key themes: Sepsis

Clinical Exercise and Cognition
Associate Professor Yvonne Learmonth leads an experienced team of researchers in the fields of biomechanics, physiology, motor control and cognition to promote the development of precision therapies.
Key contact: Yvonne.Learmonth@murdoch.edu.au
Hakuei.Fujiyama@murdoch.edu.au
Key themes: Clinical Neurorehabilitation, Psychological Resilience
Key contact: Ann-Maree.Vallence@murdoch.edu.au
Key themes: Clinical Neurorehabilitation
Key contact: T.Fairchild@murdoch.edu.au
Alasdair.Dempsey@murdoch.edu.au
Key themes: Exercise as Therapy, Metabolic Dysfunction
Key contact: Danielle.Mathersul@murdoch.edu.au
Key themes: Psychological Resilience

Economic Evaluation of Disease & Diagnostics
Associate Professor Khurshid Alam leads a group in the field of health economics and health care financing research in Murdoch where they conduct cost-effectiveness and cost-benefit analysis to examine value for money (VfM) and resource-allocation for clinical, laboratory and public health interventions.
Key contact: khurshid.alam@murdoch.edu.au
Key themes: Health economics, health care financing research

Demyelinating Diseases Group
Clinical Professor Allan Kermode and his team explore the clinical, laboratory, radiological, and immunogenetic aspects of multiple sclerosis and related disorders, which affect over 25,000 Australians.
Key contact: Belinda.Kaskow@murdoch.edu.au
Key themes: Clinical, laboratory, radiological, & immunogenetic aspects of multiple sclerosis & related disorders

Cell-Tissue Systems Modelling
Professor Bruce Gardiner's research uses computational and mathematical models to integrate the physical, chemical and biological processes underlying diseases such as osteoarthritis, colorectal cancer, acute kidney injury and glaucoma.
Key contact: B.Gardiner@murdoch.edu.au
Key themes: Computational & mathematical models



"I'm a PhD candidate at the Personalised Medicine Centre. I'm passionate about improving the lives of patients and families with a rare disease by developing treatments for those who have none."

Isabella Trew, PhD candidate

How to apply

If you are interested in the research we do in the Personalised Medicine Centre, we strongly encourage you to approach one or more of the key contacts listed below to discuss the possibility to be doing a research degree with us.

You can do this at any time during the year. If your degree involves a standalone research project, such as a PhD, you can apply to start at any time. If your degree includes coursework, you'll need to apply to start at the beginning of the relevant semester.

Once you've chosen your research topic, found a supervisor and written your research proposal, you're ready to apply for postgraduate research at Murdoch.

Honours
https://www.murdoch.edu.au/study/study-levels/honours

Research Masters with Training
https://www.murdoch.edu.au/course/research/m1262

Doctorate of Philosophy
https://www.murdoch.edu.au/study/study-levels/postgraduate

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Learn more about studying a Honours, Masters, or Doctorate of Philosophy.

Research opportunity:	Honours		Masters		PhD	X
Project title:	Patient profiling to identify sporadic ALS responders to SOD1 suppression therapy					

Short project description & main objectives:

If you are interested in working in a fast-paced research environment, working with the biotech industry and developing methods for stratifying patient responders for clinical trials, then this project is for you.

Motor neurone disease (MND), or amyotrophic lateral sclerosis (ALS), is an incurable neurodegenerative disease, characterised by the death of motor neurons and loss of muscle function. Mutations in the SOD1 protein account for ~2% of all cases, yet a huge body of evidence suggests that wildtype SOD1 has a pathogenic role in a larger proportion of patients with no family history of MND. The literature suggests that around 30% of sALS patients have pathological features that resemble SOD1 mutation patients, classified as "SOD1-like", who we believe are likely to respond to SOD1 targeted therapies.
In this project, you will seek to understand the role of SOD1 in sporadic ALS (sALS), as well as the therapeutic potential of SOD1 targeting drugs for sALS patients classified as SOD1-like.

The aims of this study are:

1. To undertake transcriptomic profiling of sporadic ALS patient-derived motor neurons to develop a molecular signature that identifies SOD1-like sALS patients.
2. To determine the therapeutic potential of our SOD1 suppression antisense oligonucleotide therapeutic in SOD1-like sALS patient motor neuron models.

The outcomes of this project will establish a molecular signature or biomarker that can be used to identify sALS patients amenable for SOD1 suppression in the clinic and will be used to inform patient selection for future clinical trials.

Key skills applied in this project:

- Cell culture of induced pluripotent stem cells and differentiation of motor neurons
- Antisense oligonucleotide transfection
- Nucleic acid analysis and qPCR
- Immunocytochemistry and confocal microscopy
- Protein analysis and western blotting
- RNA sequencing analysis

This project will be conducted in dedicated stem cell modelling laboratory facilities at the Perron Institute, as well as the PC2 laboratories at the Personalised Medicine Centre (Bld 390, Murdoch University).

Principal supervisor:	Dr Loren Flynn
Other supervisors:	Professor Anthony Akkari Dr Yuval Gurfinkel
Contact details for further information:	Loren.Flynn@murdoch.edu.au
Closing date for applications:	N/A
Start & finish date of project:	From S1 2026 – S2 2028
Available part-time?	No
Available to international students?	Yes, with an awarded International RTP

If applicable:

Research centre/group:	Personalised Medicine Centre/MND Genetics and Therapeutics
Desired background of applicants:	Bachelor's degree in biomedical science (or related) with Honours
Additional funding/scholarship provided:	Opportunity to apply for Perron Institute top-up scholarship
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Understanding cryptic splicing in motor neurone disease					

Short project description & main objectives:

Are you interested in answering unsolved questions about the pathogenic mechanisms of motor neurone disease?

Toxic aggregation of a protein called TDP-43 is a hallmark of motor neurone disease (MND), that results in the death of motor neurons resulting in the patients being unable to utilise their muscles. TDP-43 is a master regulator of pre-mRNA splicing and its dysregulation results in a cascade of unwanted cryptic splicing events that contributes to the neuronal toxicity and death. In this project, you will seek to further understand TDP-43's role in regulating these splicing events to understand a range of cryptic splicing that is considered "normal regulatory control".

The aims of this study are:

1. To characterise baseline levels of cryptic splicing of TDP-43 regulated genes in cells from MND patients and healthy controls.
2. To measure the levels of cryptic splicing following exposure to cell stressors to increase or decrease TDP-43 levels.

TDP-43 regulation of cryptic splicing has become a hot research topic in the MND field, leading to new diagnostic tools and therapeutic targets. The outcomes of this study will help to understand the thresholds for healthy and disease conditions that could inform future therapeutic interventions.

Key skills applied in this project:

- Cell culture of patient fibroblasts
- RNA extraction and PCR techniques
- Immunocytochemistry and microscopy
- RNA sequencing analysis

This project will be conducted in the PC2 laboratories of the Personalised Medicine Centre (Bld 390, Murdoch University).

Principal supervisor:	Professor Anthony Akkari
Other supervisors:	Dr Rita Mejzini Dr Loren Flynn
Contact details for further information:	A.Akkari@murdoch.edu.au
Closing date for applications:	Nov 2025
Start & finish date of project:	S1 2026 – S2 2026
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre/MND Genetics and Therapeutics
Desired background of applicants:	Biomedical science
Additional funding/scholarship provided:	N/A
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Identification of Therapeutic Compounds for Childhood Dementia					

Project description & main objectives:

Childhood dementia is caused by more than 70 rare genetic diseases. Symptoms can include memory loss, confusion, developmental regression, seizures, and difficulties with movement and communication. Sadly, it also affects the child's ability to recognise family and friends. Half of the children with dementia die by the age of 10, and there is currently no cure, though research and supportive therapies aim to improve quality of life.

Our laboratory has three decades of experience in designing and evaluating a class of drugs known as antisense oligomers (ASOs) for both rare and common diseases. We are now developing treatments for childhood dementia using ASOs.

This project aims to:

1. Modify the ASO identified from the preliminary screen to improve the efficacy of the drug
2. Compare the lead ASOs to identify the most efficient and safe chemistry

This project will involve:

- Mammalian cell culture
- Delivery of ASOs (Transfection)
- RNA extraction
- RT-PCR
- Live cell imaging

This project will be conducted in a PC2 facility at the Personalised Medicine Centre, Murdoch University.

Principal supervisor:	Dr May Aung-Htut
Other supervisors:	Dr Jessica Cale
Contact details for further information:	m.aung-htut@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Exploring Antidotes for Drug Toxicity					

Project description & main objectives:

Our laboratory has three decades of experience in designing and evaluating a class of drugs known as antisense oligomers (ASOs) for both rare and common diseases. We want to explore a way to counteract unexpected adverse events in patients when an ASO is administered. We will design antidotes based on our current knowledge of the drug mechanisms and assessed them in the human cell lines.

This project aims to:

1. Design antidotes for ASO drugs
2. Assess the potential antidotes in human cells for their ability to prevent/stop selected ASO drug toxicity.

This project will involve:

- Mammalian cell culture
- Delivery of ASOs (Transfection)
- RNA extraction
- RT-PCR
- Live cell imaging

This project will be conducted in a PC2 facility at the Personalised Medicine Centre, Murdoch University.

Principal supervisor:	Dr May Aung-Htut
Other supervisors:	Dr Jessica Cale
Contact details for further information:	m.aung-htut@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Establishing an Age-Appropriate Neuronal Cell Model to Study Age Related Neurological Disorders					

Project description & main objectives:

Do you want to be part of a team that's helping to develop new medicines for serious diseases like dementia and Alzheimer's? Our lab has been working on a type of medicine called *antisense oligomers* (ASOs) for over 30 years, and some of these drugs are already helping children with muscle diseases like Duchenne Muscular Dystrophy. Now, we're focusing on brain-related conditions—and we need your help!

In this project, you will help build a simple, brain-like cell model in the lab. These cells are made by "reprogramming" ordinary skin cells (called fibroblasts) into neuron-like cells using a special mix of small molecules. This method keeps the "age" of the cells, which helps us better study diseases that happen later in life, like Alzheimer's Disease.

Once we have these neuron-like cells, you'll test how well ASOs work by measuring their effects on gene activity and proteins linked to aging and brain disease. This project will take place in a certified PC2 lab at the Personalised Medicine Centre, Murdoch University.

This project aims to:

1. Create a brain cell model from human skin cells using small molecules.
2. Test how well ASOs enter the cells and affect gene expression.
3. Measure changes in proteins linked to age-related brain conditions.

You'll learn hands-on skills in:

- Growing human and neuron-like cells in the lab (cell culture).
- Delivering ASOs into cells (transfection).
- Extracting RNA and checking gene expression (RT-PCR, qPCR).
- Using lab techniques like immunohistochemistry and ELISA to study proteins.

General Requirements for all Students:

- Strong time management and organisation skills to follow the experimental schedule.
- Careful attention to detail and willingness to follow safety and Good Laboratory Practice (GLP) standards.
- Ability to work independently and as part of a supportive team.
- Interest in medical research, genetics, neuroscience, or biotechnology.

Principal supervisor:	Dr Kelly Martinovich
Other supervisors:	Dr May Aung-Htut Mr Aidan Murphy
Contact details for further information:	Kelly.Martinovich@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression, Molecular Biology
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	X
Project title:	The Development of Novel Tailored Therapeutics for People with Familial Hypercholesterolemia					

Project description & main objectives:

Are you interested in genetics, heart health, and cutting-edge therapies?

This project focuses on familial hypercholesterolemia (FH)—a common inherited condition that causes dangerously high levels of cholesterol from a young age. People with FH often develop heart disease early in life, sometimes as young as their teens.

FH is usually caused by mutations in the *LDLR* gene, which is responsible for clearing "bad cholesterol" from the blood. Our lab is working on a new way to help these patients by using *antisense oligonucleotides* (ASOs)—or what we like to call *gene patches*. These patches work a bit like molecular correction tape, covering up the faulty section of the gene so that the rest can still do its job. You'll be part of a research effort to develop these gene patches and test how well they work in cells—and possibly in animal models too. This project will be conducted in a certified PC2 lab at the Personalised Medicine Centre, Murdoch University.

Overall project aims:

1. Create cell models using samples from people with FH.
2. Design and test gene patches (ASOs) tailored to patient mutations.
3. Deliver ASOs into cells and check gene activity using mRNA analysis.
4. Test whether the gene patches improve cholesterol uptake.
5. Explore how these ASOs work in small animal models (optional).

You'll learn practical skills in:

- Mammalian cell culture and liver organoid culture
- Gene patch delivery (transfection)
- Gene expression analysis (RT-PCR, qPCR)
- Histology, immunohistochemistry, and western blotting
- Live cell imaging and flow cytometry
- Working with small animals (optional)

General requirements for all students:

- Strong time management and attention to detail
- Good organisation and note-keeping to track experiments
- Willingness to follow safety procedures and Good Laboratory Practice (GLP)
- Enthusiasm for learning and working in a collaborative team
- Interest in molecular biology, genetics, medicine, or biotechnology

Principal supervisor:	Dr Kelly Martinovich
Other supervisors:	Dr May Aung-Htut
Contact details for further information:	Kelly.Martinovich@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression, Molecular Biology
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	For PhD applicants, we will support you in applying for scholarships at Murdoch University and other sources as applicable.

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Evaluating New Chemistries to Improve Fibrillin-1 ASOs					

Project description & main objectives:

Marfan syndrome is a dominant connective tissue disorder cause by mutations in the fibrillin-1 (*FBN1*) gene that disrupt the formation of fibrillin-1 microfibrils. Marfan syndrome is characterised by eye, bone, skin and heart abnormalities, and while life expectancy of affected individuals has increased due to advancement in surgical interventions, there is still no effective therapies.

Our laboratory has three decades of experience in designing and evaluating a class of drugs known as antisense oligomers (ASOs) for both rare and common diseases. Our preliminary data shows that ASOs can alter the exon structure of *FBN1* mRNA transcripts to re-establish the production of fibrillin-1 microfibrils.

This project aims to:

1. Assess the ASOs identified from preliminary research as a newer chemistry to determine the most efficient and safe option.
2. Assess the effect of lead ASOs as various chemistries on fibrillin-1 microfibril formation

This project will involve:

- Mammalian cell culture
- Delivery of ASOs (Transfection)
- RNA extraction
- RT-PCR
- Immunofluorescence staining

General requirements for all students:

- Strong time management and attention to detail
- Good organisation and note-keeping to track experiments
- Willingness to follow protocols and procedures
- Enthusiasm for learning and working as a team

This project will be conducted in a PC2 facility at the Personalised Medicine Centre, Murdoch University.

Principal supervisor:	Dr Jessica Cale
Other supervisors:	Dr May Aung-Htut
Contact details for further information:	jessica.cale@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression, Molecular Biology
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	What Makes an Antisense Oligonucleotide Safe? Investigating Drivers of Toxicity					

Project description & main objectives:

Our laboratory has three decades of experience in designing and evaluating a class of drugs known as antisense oligomers (ASOs) for both rare and common diseases. ASOs are promising as therapeutics because they can selectively modulate gene expression and several ASOs have reached the clinic. However, many ASO drugs have failed pre-clinical and clinical trials due to toxicity. The molecular and structural features that distinguish safe ASOs from toxic ones remain poorly understood. This project will use high throughput analysis of our bank of ASOs to investigate key features that determine ASO safety and toxicity

This project aims to:

1. Compare known safe and toxic ASOs in their cellular uptake, cellular viability and off-target effects.
2. Identify sequence motifs, chemical modifications, or structural properties linked to adverse effects via high throughput assessment of our ASO bank.

This project will involve:

- Mammalian cell culture
- Hihg-throughput delivery of ASOs (liquid handler transfection)
- RNA extraction
- Quantitative PCR
- Live cell imaging
- RNAsequencing analysis

General requirements for all students:

- Strong time management and attention to detail
- Good organisation and note-keeping to track experiments
- Willingness to follow protocols and procedures
- Enthusiasm for learning and working as a team

This project will be conducted in a PC2 facility at the Personalised Medicine Centre, Murdoch University.

Principal supervisor:	Dr Jessica Cale
Other supervisors:	Dr May Aung-Htut
Contact details for further information:	jessica.cale@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression, Molecular Biology
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Exploring Mini-brain Models of Childhood Neurological Disorders					

Project description & main objectives:

Rare diseases, though individually uncommon, collectively affect ~300 million people and encompass over 7,000 life-threatening and debilitating conditions. Approximately 70% of rare diseases begin in childhood, ~60% of childhood deaths are caused by rare diseases, and one in four children with a rare disease will survive beyond the age of five.

Our research aims to address a major challenge of rare disease research, which is the lack of appropriate disease models. We are focusing on rare neurological disorders, because 90% of rare childhood diseases have significant neurological effects. We have generated three-dimensional (3D) brain organoids, which are mini models of the human brain, using cells from children with rare neurological disorders. These mini brain models will help us better understand the diseases and assess potential new treatments.

This project aims to:

1. Compare the growth, morphology, and cellular composition of brain organoids derived from children with neurological disorders to those derived from healthy controls.
2. Assess the delivery and distribution of antisense drugs in mini-brain models.

This project will involve:

- Organoid cryosectioning
- Immunocytochemistry
- Microscopy
- RNA extraction
- Quantitative PCR

General requirements for all students:

- Strong time management and attention to detail
- Good organisation and note-keeping to track experiments
- Willingness to follow protocols and procedures
- Enthusiasm for learning and working as a team

This project will be conducted in a PC2 facility at the Personalised Medicine Centre, Murdoch University.

Principal supervisor:	Dr Jessica Cale
Other supervisors:	Dr Karina Yui Eto
Contact details for further information:	jessica.cale@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Molecular biology
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Urine-derived Stem Cells as Non-Invasive Proxies for Neuronal Transcriptomes in Rare Disease Diagnosis					

Project description & main objectives:

Urinary stem cells (USCs) are a promising non-invasive cell source for transcriptomic analysis in patients with rare or severe diseases where neuronal tissue biopsy is not feasible. Establishing whether USCs can serve as a proxy for neuronal cells could provide a valuable tool for diagnosis and therapeutic research, especially in paediatric and neurodegenerative conditions.

This project will investigate the transcriptomic similarity between USCs and neuronal cell types by utilising long-read PacBio RNA sequencing data. Specifically, it will quantify isoform-level overlap, assess the presence of cell-type-specific isoforms, and apply computational analyses such as clustering and dimensionality reduction to evaluate overall transcriptomic similarity.

This project aims to:

1. Quantify isoform overlap between USC, induced pluripotent stem cells (iPSC), and neural progenitor cells (NPC) transcriptomes using long-read sequencing data.
2. Identify and characterise isoforms unique to neuronal cells and evaluate their presence or absence in USCs.
3. Assess overall transcriptomic similarity using clustering and dimensionality reduction techniques

This project will involve:

1. Long-read RNA-seq analysis (PacBio IsoSeq)
2. Transcript annotation and isoform quantification
3. Dimensionality reduction and clustering (e.g. UMAP, PCA)

This project will be computational in nature and will use existing PacBio datasets from USC, iPSC, and NPC lines. Analysis will be conducted using high-performance computing resources with support from the supervisors.

Principal supervisor:	Dr Anu Sooda
Other supervisors:	Dr Jessica Cale
Contact details for further information:	a.sooda@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression, bioinformatics
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Dissection of Hidden Layers of Microexon Splicing Signatures in Neurological Disorders					

Project description & main objectives:

Microexons, small exons ranging from 3 to 27 nucleotides, have recently been recognised as key regulators of gene expression, particularly in neuronal function. Despite their small size, these exons can profoundly impact protein structure and cellular processes. Dysregulation of microexon splicing has been implicated in various neurological disorders, including autism spectrum disorder, epilepsy, and others. However, the role of microexons in these diseases remains largely unexplored. This gap in understanding is partly due to the challenges in detecting these low abundance splicing events, as they are often overlooked or misannotated in standard genome annotations. As a result, the potential contribution of microexons to disease mechanisms has yet to be fully appreciated.

This project aims to develop a computational pipeline specifically designed to identify and analyse microexon splicing events in RNA-seq data from neurological disorder cohorts. This pipeline will focus on detecting low abundance splicing events that are often missed by conventional annotation tools.

Objectives:

1. Develop computational pipeline to detect microexon splicing events in RNA-seq data from neurological disease cohorts.
2. Quantify and compare microexon inclusion/exclusion patterns across disease states.
3. Experimentally validate a subset of predicted microexons using RT-PCR and sequencing to assess their regulatory role in disease.

This project will involve:

- Downloading public RNA-seq datasets
- Building a pipeline using available bioinformatic tools
- RT-PCR and Sanger sequencing

This project will be computational in nature and analysis will be conducted using high-performance computing resources with support from the supervisors.

Principal supervisor:	Dr Anu Sooda
Other supervisors:	Dr May Aung-Htut
Contact details for further information:	a.sooda@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 – S1 2026, S2 2026 – S1 2027
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Molecular Therapy Laboratory
Desired background of applicants:	Gene expression, bioinformatics, and molecular biology
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	X
Project title:	Omics approaches define genetic and cellular markers of severe drug reactions					

Short project description & main objectives:

Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN) is a severe drug reaction defined by cytotoxic CD8+ T-cell-mediated keratinocyte death and 50% mortality. Moreover, survivors are left with life-limiting morbidities including blindness and reproductive, respiratory, and mental health issues. However there remain no targeted treatments without an understanding of the cell response driving disease in the affected skin of patients.

While pharma remains without reliable platforms to predict T-cell immunogenicity, the discovery of genetic human leukocyte antigen (HLA) risk alleles has enabled pharmacogenomic prevention in patients, with interaction of an HLA, peptide, and T-cell receptor (TCR) a requirement for CD8+ T-cell activation. However, different primary HLA alleles drive SJS/TEN across populations, and individuals comprise diverse TCR clonotypes, challenging the identification of pathogenic TCR and peptides to enable structural prevention strategies.

We are world leaders in defining mechanisms of SJS/TEN toward new prevention and treatment approaches. We have diverse projects available using cutting-edge technologies including:

- Single-cell and spatial sequencing to define cellular mechanisms in the affected tissue
- Phenomics studies to define diagnostic biomarkers in the blood
- The development of pre-clinical models for pharma to help understand risk posed by new drugs

These projects will deliver a deep understanding of genomics, T-cell, and immunology/immunotoxicology relevant across disease settings towards careers in academia, health, or the pharmaceutical industry.

You should have an interest in medical research, genetics, and drug development/treatment, have strong time and organizational management skills, and the ability to work independently as part of a supportive team. Knowledge of R and/or Python would be advantageous but is not required if the applicant is willing to learn.

For further information please contact Associate Professor Andrew Gibson.

Principal supervisor:	Associate Professor Andrew Gibson
Other supervisors:	Associate Professor Abha Chopra, Professor Elizabeth J Phillips
Contact details for further information:	Andrew.gibson@murdoch.edu.au
Closing date for applications:	July 2026
Start & finish date of project:	S1 2026 onwards
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre, Drug Allergy
Desired background of applicants:	Immunology, Biomedical Sciences, Bioinformatics
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	The Development of a Skeletal Muscle Cell Model to Investigate the Role of Myositis Autoantibodies					

Short project description & main objectives:

Myositis is a group of autoimmune diseases characterised by muscle inflammation and progressive weakness. Many patients produce autoantibodies but the precise role of these autoantibodies in disease pathogenesis remains unclear. Developing a controlled in vitro model provides a powerful tool to study direct antibody effects on muscle cells, contributing to our understanding of disease mechanisms and potentially guiding therapeutic strategies.

The primary aim of this project is to establish and validate a skeletal muscle cell culture system for the study of autoantibody-mediated effects. Specific objectives include:

- Optimise the differentiation of myoblasts derived from human skeletal muscle into myotubes.
- Characterise the expression of key muscle markers during differentiation.
- Introduce patient-derived autoantibodies to differentiated myotubes and assess cellular responses.
- Investigate potential changes in cell viability, morphology, or signalling pathways following antibody exposure.

You will learn and apply the following methods:

- Cell culture and differentiation of skeletal muscle cells.
- Immunocytochemistry and microscopy.
- Electrophoresis and Western blotting.
- Bulk RNA sequencing analysis.

This project will be conducted in a PC2 laboratories of the Personalised Medicine Center (Bld 390, Murdoch University).

Principal supervisor:	Nataliya Slater
Other supervisors:	
Contact details for further information:	nataliya.slater@murdoch.edu.au
Closing date for applications:	Nov 2025
Start & finish date of project:	S1 2026 – S2 2026
Available part-time?	Yes
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Center/Myositis Discovery Programme
Desired background of applicants:	Biomedical Science
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Identification of T cell antigens in Inclusion Body Myositis					

Short project description & main objectives:

Inclusion Body Myositis is a chronic autoimmune myopathy marked by CD8+ T cell infiltration into skeletal muscle. The persistent presence of clonally expanded T cells suggests antigen-driven selection; however, the specific autoantigens remain unidentified. By leveraging TCR repertoire data and transcriptomic profiles of muscle tissue, this project seeks to computationally predict likely antigenic candidates, potentially providing insight into the pathogenesis of IBM and identifying targets for diagnostic or therapeutic development.

The main goal of this project is to use computational biology methods to infer potential T cell antigens in IBM. Specific objectives include:

- Analyse single-cell TCR sequencing datasets to identify clonally expanded T cells in IBM.
- Explore available epitope databases (e.g. IEDB, VDJdb) for cross-reactive matches or known immunogenic peptides.

You will learn some of the most in-demand computational biology skills, such as:

- TCR Repertoire Analysis using tools such as Immunarch, scRepertoire, or scirpy.
- Muscle RNA-seq Data Mining (e.g. GTEx, or patient-derived RNA-seq) to identify expressed transcripts in skeletal muscle.
- Antigen Prediction and Epitope Mapping using bioinformatics platforms like IEDB, NetMHC, and sequence alignment tools (BLAST).
- Visualisation of results using R for plotting clonal expansion, gene expression, and candidate antigen matches.

This project will be conducted at the Personalised Medicine Center (Bld 390, Murdoch University).

Principal supervisor:	Nataliya Slater
Other supervisors:	
Contact details for further information:	nataliya.slater@murdoch.edu.au
Closing date for applications:	July 2025
Start & finish date of project:	S2 2025 – S1 2026
Available part-time?	Yes
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Center/Myositis Discovery Programme
Desired background of applicants:	Understanding of basic immunology, some experience using R for data analysis
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Develop a POC testing platform for infectious diseases using genetic material					

Short project description & main objectives:

The aim of the project is to develop a point of care (POC) testing system for infectious diseases based on RNA or DNA.

A point-of-care (POC) testing system for infectious diseases based on RNA or DNA is a compact, user-friendly device that enables rapid detection of pathogens directly from patient samples such as saliva, swabs, or blood, without requiring a central laboratory. The process generally involves releasing genetic material from the sample, amplifying it using simple constant-temperature methods, and detecting specific pathogen sequences with a visible readout, such as a colour change or a test strip. By integrating disposable cartridges pre-loaded with reagents and a small reader or smartphone app, these systems can deliver accurate results in under 30 minutes, making them highly suitable for clinics, pharmacies, or home use, and supporting earlier diagnosis, treatment, and infection control.

Principal supervisor:	Associate Professor Mark Watson
Other supervisors:	Professor Sulev Koks, Associate Professor Abha Chopra
Contact details for further information:	Mark.watson@murdoch.edu.au
Closing date for applications:	Open until filled
Start & finish date of project:	6-8 months from start
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Medical Genomics Laboratory
Desired background of applicants:	A background in molecular biology would be required for this project.
Additional funding/scholarship provided:	No
Other benefits:	Access to the very latest technology including nucleic acid sequencing platforms and automation technology.
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Develop a fast nucleic acid extraction process from minimally invasive sampling					

Short project description & main objectives:

The aim is to develop and validate a technology for fast nucleic acid extraction using minimally invasive sampling. A rapid nucleic acid extraction process transforms small, low-yield samples (saliva, buccal swab, finger-prick blood, dried blood spot) into PCR/LAMP/CRISPR-ready DNA/RNA within minutes, without using columns or centrifuges. It utilises chemical and thermal lysis, magnetic-bead solid-phase capture, two quick alcohol washes, and hot, low-volume elution. Reagents can be premixed or lyophilised for use in the field. The eluate is designed to tolerate inhibitors, allowing direct use in downstream amplification.

Principal supervisor:	Associate Professor Mark Watson
Other supervisors:	Professor Sulev Koks, Associate Professor Abha Chopra
Contact details for further information:	Mark.watson@murdoch.edu.au
Closing date for applications:	Open until filled
Start & finish date of project:	6-8 months from start
Available part-time?	No
Available to international students?	Yes

If applicable:

Research centre/group:	Medical Genomics Laboratory
Desired background of applicants:	A background in Molecular Biology would be required for this project
Additional funding/scholarship provided:	No
Other benefits:	Access to the very latest technology including nucleic acid sequencing platforms and automation technology
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	The development of targeted therapies using antisense oligonucleotides for the treatment of aggressive cancers					

Short project description & main objectives:

Aggressive advanced-stage cancers claim the lives of many Western Australians. Over 4,000 cancer-related deaths were reported in WA in 2019. The majority of these deaths are due to cancers that have spread or returned following remission. Sadly, patients with aggressive cancers face a grim reality, as they are often incurable and currently available therapies leave patients with undesirable side effects. Our patient community has identified the need for new personalised therapies to treat advanced-stage cancers.

Cancer poses a massive disease burden on Western Australians and there is an urgent need for the development of new treatment options to benefit patients across WA and around the world. Our proposed project will develop novel a precision medicine using antisense oligonucleotides (ASOs), to modulate gene expression and directly target cancer-causing genes mutated in cancers. Successful ASO therapies have recently been approved by the US FDA for the treatment of Duchenne muscular dystrophy and spinal muscular atrophy, and approximately 45 clinical trials are currently underway for the treatment of cancer. Our project will develop ASO drugs for treating cancers harbouring mutations in genes that form part of a chromatin remodelling complex mutated in ~20% of all human cancers. Mutations in this complex have been linked to aggressive cancers, cancer reoccurrence and metastasis. In particular, the genes our drugs will target are commonly mutated in lung cancer and melanoma that inflict a significant disease burden in WA. Our research will potentially lead to the use of novel therapies in the clinic and offers promise for improved patient outcomes and an overall reduced cancer disease burden.

Objectives: To screen ASOs designed to modulate specific genes found in 20% of all cancers.

Aim 1: To screen ASO drug candidates and assess knockdown of specific genes in cancer cell lines.
Aim 2: To assess our ASOs for their anti-cancer properties, including cell viability and tumourgenicity, to identify lead molecules for *in vivo* assessment (future work).

This project will involve:

- Cell culture
- Molecular Biology
- RNA extractions and analysis
- PCR design and optimisation
- Microscopy

Principal supervisor:	Dr Ianthe Pitout
Other supervisors:	Dr Vanja Todorovski Professor Susan Fletcher
Contact details for further information:	i.pitout@murdoch.edu.au
Closing date for applications:	Open
Start & finish date of project:	Open; one year from start date
Available part-time?	Yes
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre/Oligo Therapeutics Laboratory
Desired background of applicants:	Biology (cell or molecular)
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours	X	Masters		PhD	
Project title:	Evaluation of novel modifications to antisense oligonucleotides to enhance delivery to cells of the central nervous system					

Short project description & main objectives:

Antisense oligonucleotides (ASO) are the ultimate precision medicine and have the potential to provide new and much-needed medicines to patients with neurological diseases. However, whilst nucleic acid therapeutics have enormous potential to treat inherited and acquired disease, achieving efficient delivery and uptake in target organs/cells remains a barrier. The central nervous system, in particular, presents a challenge to ASO drug uptake. Furthermore, the brain is composed of diverse cell types and it is important to determine the uptake and distribution of our drug candidates in more complex patient-derived models e.g., brain organoids, to ensure they are delivered predominantly to the cell types primarily affected in a given neurological disorder.

In this project we will screen several novel ASO modifications and conjugates in laboratory models to identify modifications that enhance ASO uptake in the central nervous system.

This project will involve:

- Cell culture and transfection
- RNA extractions
- ddPCR
- Immunofluorescence
- Microscopy

Principal supervisor:	Dr Ianthe Pitout
Other supervisors:	Professor Susan Fletcher Dr Leon Larcher Dr Vanja Todorovski
Contact details for further information:	i.pitout@murdoch.edu.au
Closing date for applications:	Open for 2025 early or mid-year intake
Start & finish date of project:	10 months from start date
Available part-time?	Yes
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre/Oligo Therapeutics Laboratory
Desired background of applicants:	Biology (cell or molecular)
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	

Research opportunity:	Honours		Masters		PhD	X
Project title:	Exploring presymptomatic indicators for an inherited form of motor neuron disease					

Short project description & main objectives:

Motor neuron disease (MND) is caused by the loss of special cells in the brain that control movement. MND patients seldom survive beyond 5 years from diagnosis, and sadly, there are no effective treatment options and very few new treatments have been approved for MND patients in Australia in the last 30 years. MND is a complex disease with a brain and spinal cord pathology that can start ~10 years before symptom onset. Since 2017, we have worked with several patient representatives from a WA family that has lost 6 members to an inherited form of MND, caused by an expansion repeat mutation in the *C9ORF72* gene, to prioritise and guide our research. Our patient community have identified the need for early disease detection in the presymptomatic *C9ORF72* mutation positive population to enable the potential for early treatments and interventions that may delay onset and/or slow the course of their disease. In this project, we aim to explore indicators in presymptomatic mutation carriers and develop a methodology taking into account biomarkers from a blood test, family history of the disease and age-associated risk to identify those who have disease pathology and are at risk of developing MND in the future. Early identification of disease may lead to early intervention with approved MND treatments and/or enable clinical trials for emerging targeted therapeutics in presymptomatic mutation carriers.

In this project, you will work with a multidisciplinary team of researchers and clinicians that span the laboratory, clinic, bioethics and health economics.

Principal supervisor:	Dr Ianthe Pitout
Other supervisors:	Professor Susan Fletcher Professor Anthony Akkari Professor Merrilee Needham
Contact details for further information:	i.pitout@murdoch.edu.au
Closing date for applications:	Open for 2025
Start & finish date of project:	3 years from start date
Available part-time?	Yes
Available to international students?	Yes

If applicable:

Research centre/group:	Personalised Medicine Centre/Oligo Therapeutics Laboratory
Desired background of applicants:	Biology (cell or molecular)
Additional funding/scholarship provided:	NA
Other benefits:	
Extra Comments:	