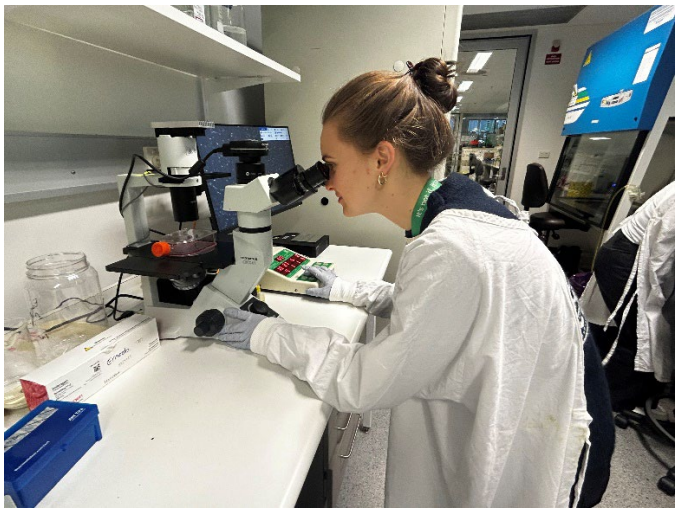
STUDENT PROJECTS 2026

CHILDREN'S CANCER INSTITUTE



Children's Cancer Institute

UNSW SYDNEY

Curing childhood cancer. It's not if. It's **when**.

CHILDREN'S CANCER INSTITUTE

A MESSAGE FROM EXECUTIVE DIRECTOR **PROFESSOR MICHELLE HABER, AM**

Like every one of you, here at Children's Cancer Institute, we believe that a life should be long. That every child should have the chance to grow up, grow old, chase their dreams, and fulfil their potential.

Today, as a result of medical research, eight out of ten children will survive their cancer. But, unfortunately, nearly three children in Australia are still dying from this disease every week. We believe this is three too many.

From the very beginning, our focus has been to cure all children with cancer and eliminate their suffering. While we are getting closer to this aim, there is so much more to do.

Children's Cancer Institute is the only independent medical research institute in Australia wholly dedicated to putting an end to childhood cancer. We use a multi-pronged approach to tackling childhood cancer by investigating causes and prevention, improving diagnosis and monitoring and developing more effective treatments, with the overall goal of saving the lives of all children with cancer and improving their long-term health outcomes, through research.

Based at the Lowy Cancer Research Centre at UNSW, we have world-class facilities and global collaborations with researchers and clinicians. At the end of this year, we will be moving into the Minderoo Children's Comprehensive Cancer Centre (MCCCC), the first of its kind in Australia and a world-class facility to accelerate the implementation of discoveries into standard care for children with cancer. MCCCC is a collaboration between Children's Cancer Institute, the Kids Cancer Centre at Sydney Children's Hospital, Randwick, and UNSW Sydney, that will ultimately bring together over 900 clinicians and clinical staff, researchers and academics into a new integrated facility, all with the sole focus of curing children's cancer, delivering globally leading research, education and clinical care.

Children's Cancer Institute nurtures an environment of innovation, collaboration and learning. We are committed to fostering the next generation of research leaders. As one of our students, you will be provided with personalised training in state-of-the-art facilities and will be mentored by internationally renowned research leaders with a strong focus on training the future generations of cancer researchers.

Student opportunities at the Institute are listed in the following pages. If you are interested in exploring these further, please get in touch with the listed supervisor. If you are interested in a particular area of research but do not find a project that appeals to you listed here, we encourage you to contact the leaders of these programs directly to discuss a project to best suit both you and the research team.

By joining Children's Cancer Institute, you have the opportunity to work at the forefront of cancer research and really make a difference in the lives of children with cancer. I look forward to welcoming you to Children's Cancer Institute,

Michelle Haber

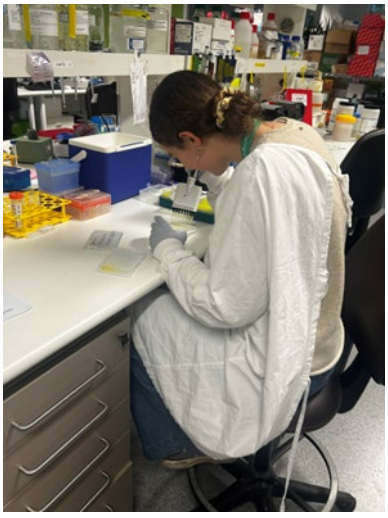
RESEARCH FACILITIES, PLATFORMS & TECHNOLOGIES

Children's Cancer Institute (CCI) was established in 1976 and is the only independent medical research institute in Australia wholly dedicated to curing childhood cancer. With over 350 staff and students, CCI is internationally recognised as a leading child cancer research institute.

CCI is known for its research excellence in neuroblastoma and other high-risk childhood cancers including leukemia, brain tumours and sarcoma, and has received widespread international recognition for its ZERO Childhood Cancer national child cancer precision medicine program (ZERO) which is currently being rolled out to every Australian child with cancer, irrespective of type or risk of their cancer, or where in Australia they live.

Facilities & Resources

- State-of-the-art PC2 laboratories
- Core Services team to facilitate the efficient day-to-day operation of the labs
- Own animal facility, where expert staff provide researchers with training and advice
- Close relationship with clinicians at the Kids Cancer Centre (KCC), Sydney Children's Hospital, providing access to many thousands of clinical tumors, blood, serum, bone marrow and other tissue samples for research use.
- Robust computing and technology capabilities to support its critical research efforts.
- CCI Cell Bank: quality managed, STR-validated, mycoplasma-free stocks of over 20 of the most widely used cancer cell lines
- CCI Tumour Bank: over 9000 paediatric cancer patient samples ranging from frozen or cryo-preserved tumour tissue to cryo-preserved extracted blood products derived from bone marrow and peripheral blood.
- The ZERO Childhood Cancer program, Australia's national personalised medicine program, available to every Australian child with cancer. Led by Children's Cancer Institute and the Kids Cancer Centre at Sydney Children's Hospital, Randwick, ZERO is a true multidisciplinary team effort of researchers and clinicians and includes all nine of Australia's children's hospitals together with 22 national and international research partners.



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- Conducting in-depth genomic analysis for each child enrolled, ZERO aims to improve survival, reduce side effects, and advance science's understanding of childhood cancer for the benefit of all.
- With over 1400 patients enrolled on ZERO, researchers have unique access to thousands of biospecimens with linked clinical data from high-risk patients spanning the full range of childhood cancers.
- Through ZERO, in addition to the biospecimens, we also have a unique database of linked molecular information including Whole Genome Sequencing (WGS) for both tumor and germline, as well as tumor whole transcriptome sequencing (RNA seq) and methylome data on all of the patients enrolled in ZERO.
- The number of samples with linked clinical and molecular data will increase dramatically over the next 5 years.

Platforms and Technologies:

The ACRF Drug Discovery Centre

Established in 2010, the ACRF Drug Discovery Centre houses a sophisticated array of advanced automation equipment and technology to integrate biological assay data with chemical compound information. The facility also provides dedicated specialist scientists with expertise in high-throughput small molecule screening, providing support for drug discovery research. With an extensive library of 320,000 diverse novel compounds, over 6000 known bioactives and FDA-approved agents (including 114 FDA-approved oncology drugs), specialised cutting-edge instrumentation for high-throughput liquid handling, automated high-content screening, various other equipment such as plate readers, as well as advanced data management systems, the facility is primed to support researchers in their drug discovery journey. In 2020, the Drug Discovery Centre expanded to incorporate an exciting new drug discovery initiative called 'THerapeutic INnovations for Kids' (THINK). THINK is an end-to-end drug discovery and development capability dedicated to generating new therapies for rapid clinical application in children with cancer.

The ACRF Child Cancer Liquid Biopsy Facility

The ACRF Child Cancer Liquid Biopsy Facility is the first of its kind in Australia and provides infrastructure and expertise to enable the development of non-invasive disease monitoring techniques to inform risk-adjusted treatment regimens. The state-of-the-art facility houses a suite of complementary technologies for enrichment and purification of CTCs (FACS Fusion and microfluidics), precision dispensing of single cells (CellenONE) and platforms to conduct both single cell RNA Sequencing (BD Rhapsody) and single cell DNA Sequencing (MissionBio Tapestri). Additionally, it has been designed to provide access to ultrasensitive molecular pipelines dedicated to the analysis of low input and cell free DNA.

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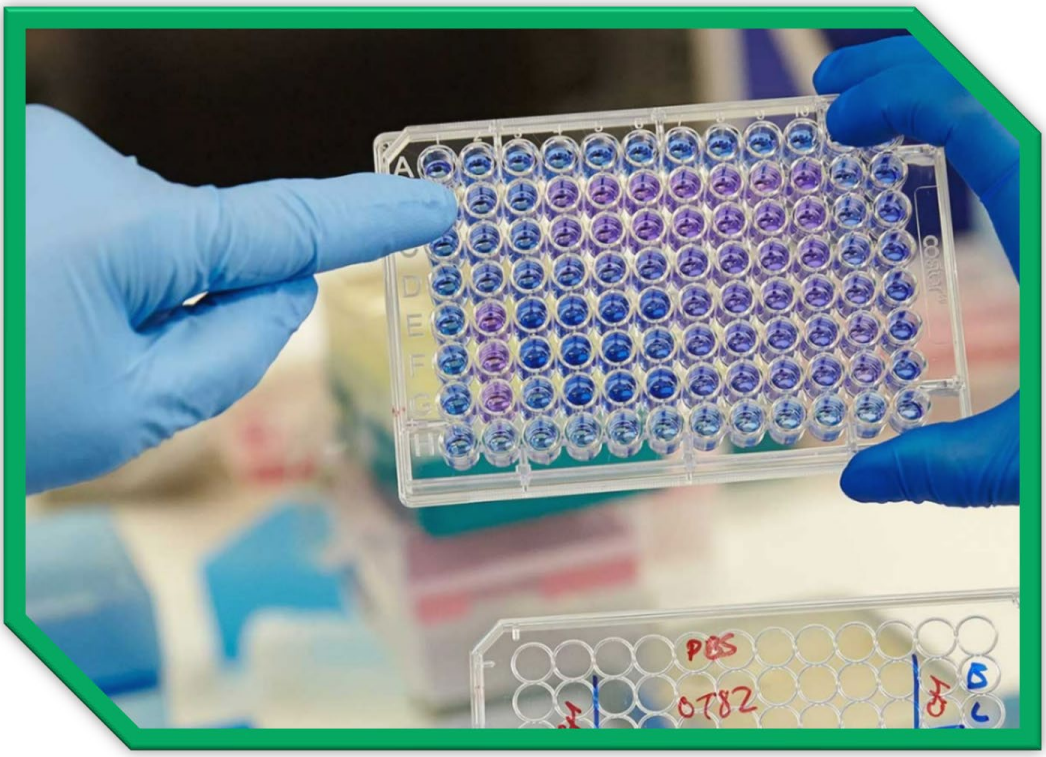
The ACRF Spatial Immune Oncology Facility

The Institute will also soon house the ACRF Spatial Immune Oncology Facility, containing the latest cellular and sub-cellular spatial multiomic profiling technologies. Combined with the ability to create bespoke tissue microarrays, access to high dimensional cytometry and advanced protein profiling tools, the facility will provide the equipment and expertise to accelerate the development of more effective immunotherapeutic approaches and stratification systems for children with cancer and to generate a complete view of the tissue immune microenvironment in paediatric cancer to date.

Bioinformatics Platform

CCI has a dedicated team that oversees all the bioinformatic data analysis for every research team at the Institute, as well as aiding clinicians at the Kids Cancer Centre in the Sydney Children's Hospital. This includes developing and maintaining next generation sequencing pipelines with the latest bioinformatic algorithms for analysis of whole-genome and exome sequencing, transcriptome sequencing, targeted sequencing, single-cell RNA sequencing, ChIPseq; as well as microarray analysis, drug sensitivity, biomarker discovery, and risk prediction analysis. CCI has recently transitioned from an in-house HPC to a cloud-based analysis platform, which is available to all researchers at CCI not just bioinformaticians and computational biologists.



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Minderoo Children's Comprehensive Cancer Centre

Minderoo Children's Comprehensive Cancer Centre (MCCCC) signals a new era of hope for kids with cancer. Australia's first dedicated children's comprehensive cancer centre, MCCCC promises to deliver tomorrow's care today — transforming experiences and outcomes for children and young people with cancer.

MCCCC builds on a strong history of collaboration. Children's Cancer Institute and the Kids Cancer Centre (Sydney Children's Hospitals Network) share an almost 40-year history of working together to translate laboratory discoveries into clinical trials and medical care. MCCCC maximises the potential of this collaboration by bringing together the Children's Cancer Institute, Kids Cancer Centre and University of New South Wales in a formal partnership with a shared strategy and co-located in a purpose-designed building. Together we will improve outcomes for children and young people with cancer, by transforming the cancer journey from diagnosis through treatment and into survivorship.

Opening at the end of 2025, Australia's first children's comprehensive cancer centre, MCCCC will include:

- a 900-strong community of dedicated child cancer professionals: clinicians, scientists, and allied health workers
- state-of-the-art technologically advanced wet and dry laboratory spaces
- education, training and research spaces
- new oncology inpatient units designed with a child and family focus
- a new outpatient treatment centre with capacity to deliver a range of therapies now and into the future.

STUDENT SUPPORT

Our students bring great energy and enthusiasm, providing fresh ideas and perspectives to tackle the complex challenges faced in childhood cancer research today. As a student, you will be guided and mentored by a dynamic team of world class researchers who have strong collaborative links with research and clinical teams throughout the world. In addition to this, you will have access to a comprehensive professional development program run by a dedicated team focussed on career development, state-of-the-art equipment and facilities, professional support staff, access to a full range of laboratory services and opportunities for overseas travel to present at conferences and work with collaborators. You will also receive the support of your peers through the Children's Cancer Institute Student Association (CCIStA) that runs activities throughout the year, including an annual student retreat.

POSTGRADUATE TOP UP SCHOLARSHIP

The CCI Top Up is a scholarship Top-Up offered to full time Higher Degree Research students who have been awarded a competitive scholarship (usually from UNSW). The top up is additional to the scholarship stipend and they total $40,000p/a (tax free). The Top Up award supports living costs while studying.

JOSH McCARROLL MEMORIAL PhD AWARD

This competitive tax-free award, to a value of up to $10,000 AUD per annum, is offered to students demonstrating exceptionally high potential who have succeeded in attracting a primary competitive scholarship. The Josh McCarroll Memorial PhD Award is in addition to the top-up scholarship.

HONOURS SCHOLARSHIP

We offer two Honours year scholarships of $5,000 tax free annually. Selection is based on academic achievement throughout the undergraduate degree, interest in cancer research, personal qualities, as well as other evidence as may be deemed relevant to future success in the area of biomedical research. Scholarships are awarded for one year and are not deferrable.

Applications for Honours year scholarships will be open in October each year and close in early-November.

Escape Room at the 2024 annual student retreat

HOW TO BECOME A STUDENT

1. Browse the information and lists of student projects in this booklet.
2. Identify an area of interest, contact a potential supervisor and arrange a suitable project. When you contact potential supervisors, please include a CV and your most recent academic transcript.
3. Submit an admissions application to the UNSW Sydney. Honours students must be accepted into an Honours program in an appropriate UNSW Faculty. PhD students should successfully fulfil the requirements for admissions through UNSW.
4. Coordinate with your supervisor to obtain clearances from the appropriate Ethics Committees.
5. Begin your research program.

HONOURS

The standard duration of enrolment for an Honours degree is one academic year, actual dates for the Honours programs you may enroll in can vary, so please consult the websites below for more detailed information.

When you undertake an Honours project at Children's Cancer Institute you will be enrolled in a UNSW Honours program. Therefore, you need to meet the UNSW Honours entry criteria. For information regarding the Honours Programs at UNSW that students may be enrolled in, please visit the following websites:

- https://www.unsw.edu.au/science/our-schools/babs/student-life-resources/student-resources/honours
- https://www.unsw.edu.au/medicine-health/our-schools/biomedical-sciences/student-life-resources/honours/soms-honours
- https://www.unsw.edu.au/science/student-life-resources/honours-how-apply

POSTGRADUATE STUDIES (Masters / PhD)

The majority of PhD students at the Institute are enrolled through the Faculty of Medicine, School of Clinical Medicine, Paediatrics, Course Code 1825 Child Cancer Research. Associate Professor Fatima Valdes Mora (FValdesMora@ccia.org.au) is the School's Postgraduate Coordinator and is responsible for advising supervisors and Higher Degree Research (HDR) candidates on all academic and administrative matters relating to their candidature.

UNSW Graduate Research School

The UNSW Graduate Research School is the central administrative and support unit for all higher degree research students and their supervisors at UNSW. The website below will direct you to information on admissions requirements and enrolment procedures to undertake postgraduate study at UNSW together with links to scholarship application forms for both local and international students. https://research.unsw.edu.au/graduate-research

CHILDREN'S CANCER INSTITUTE

RESEARCH GROUPS

Listed below are our Research Groups and their Leaders. Please take a look at our website for more information on their areas of research focus. We are always looking for enthusiastic students interested in our research.

Theme	Group	Role	Contact
Cancer Biology	**Prof Glenn Marshall**  EMBRYONAL CANCER THERAPY AND PREVENTION GROUP	*Group Leader*	**GMarshall@ccia.org.au**
Cancer Biology	**A/Prof Charles de Bock**  FUNCTIONAL GENOMICS OF LEUKAEMIA GROUP	*Group Leader*	**CDeBock@ccia.org.au**
Cancer Biology	**Dr Mark Pinese**  GENOMIC CHILDHOOD CANCER RISK GROUP	*Team Leader:*	**MPinese@ccia.org.au**
Cancer Biology	**Prof Richard Lock**  LEUKAEMIA BIOLOGY GROUP	*Group Leader & Theme Head - Cancer Biology*	**RLock@ccia.org.au**

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Theme	Group	Role	Contact
Cancer Biology	**A/Prof Paul Ekert**  TRANSLATIONAL TUMOUR BIOLOGY GROUP	*Group Leader and Deputy Director - Research Themes*	**PEkert@ccia.org.au**
Clinical Translation	**A/Prof Mark Cowley**  COMPUTATIONAL BIOLOGY GROUP	*Group Leader and Deputy Director - Enabling Platforms and Collaboration*	**MCowley@ccia.org.au**
Clinical Translation	**Dr Michelle Henderson**  MOLECULAR DIAGNOSTICS GROUP	*Principal Scientist*	**MHenderson@ccia.org.au**
Clinical Translation	**A/Prof Emmy Fleuren**  SARCOMA BIOLOGY AND THERAPEUTICS GROUP	*Team Leader*	**EFleuren@ccia.org.au**
Clinical Translation	**A/Prof Vanessa Tyrrell**  ZERO Childhood Cancer	*Program Director & Theme Head – Clinical Translation*	**vtyrrell@ccia.org.au**

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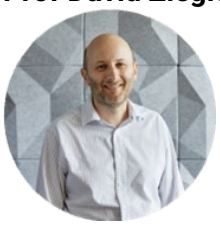
Theme	Group	Role	Contact
Therapeutic Discovery	**Prof David Ziegler**  BRAIN TUMOURS GROUP	*Group Leader*	**DZiegler@ccia.org.au**
Therapeutic Discovery	**A/Prof Fa Valdes Mora**  CANCER EPIGENETIC BIOLOGY AND THERAPEUTICS GROUP	*Team Leader & Theme Head - Therapeutic Discovery*	**FValdesMora@ccia.org.au**
Therapeutic Discovery	**Dr Jean Bertoldo**  CHEMICAL BIOLOGY AND TARGET BASED THERAPIES GROUP	*Team Leader*	**JBertoldo@ccia.org.au**
Therapeutic Discovery	**A/Prof Antoine de Weck**  COMPUTATIONAL DRUG DISCOVERY BIOLOGY GROUP	*Group Leader*	**ADeWeck@ccia.org.au**
Therapeutic Discovery	**Prof Michelle Haber and Prof Murray Norris**   EXPERIMENTAL THERAPEUTICS & MOLECULAR ONCOLOGY GROUP	*Group Leader & Executive Director/ Group Leader*	**MHaber@ccia.unsw.edu.au** **MNorris@ccia.org.au**

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Theme	Group	Role	Contact
Therapeutic Discovery	**A/Prof Tao Liu**  GENE DYSREGULATION GROUP	*Group Leader*	**TLiu@ccia.org.au**
Therapeutic Discovery	**Prof Ian Street and A/Prof Greg Arndt**  THINK / DDC	*Group Leader / Head of Drug Discoery*	**istreet@ccia.org.au**
Therapeutic Discovery	**Prof Maria Kavallaris**  TRANSLATIONAL CANCER NANOMEDICINE GROUP	*Group Leader*	**MKavallaris@ccia.org.au**
Therapeutic Discovery	**Dr Angelica Merlot**  CANCER TARGETS AND THERAPEUTICS GROUP	*Research Fellow*	**AMerlot@ccia.org.au**

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PROJECTS

Project Number	Project Name	Supervisors
BRAIN TUMOURS GROUP		
Project 1	Targeting Protein Citrullination for the treatment of Medulloblastoma	Dr Ben Rayner Dr Aaminah Khan
COMPUTATIONAL BIOLOGY GROUP		
Project 2	The onco-mitochondrial landscape of childhood cancer	Dr Piyushkumar Mundra A/Prof Mark Cowley
MOLECULAR DIAGNOSTICS GROUP		
Project 3	Advancing and Refining Molecular Monitoring for Children with Leukaemia	A/Prof Michelle Henderson Dr Toby Trahair
Project 4	Liquid Biopsy for Molecular Monitoring of Early Relapse in Children with Leukaemia	A/Prof Michelle Henderson Dr Narges Bayat
SARCOMA BIOLOGY AND THERAPEUTICS GROUP		
Project 5	Discovering actionable drug targets for young patients with sarcoma through phosphoproteomics	A/Prof Emmy Fleuren TBC
Project 6	Finding better and kinder treatments for young patients with osteosarcoma and beyond	A/Prof Emmy Fleuren TBC
EMBRYONAL CANCER THERAPY AND PREVENTION GROUP		
Project 7	A Systematic and Multi-Modal Framework to Identify and Target Metabolic Vulnerabilities Following Chemotherapy in Childhood Cancers	A/Prof Belamy Cheung Dr Kenny Yeo
Project 8	Therapeutic Targeting of Chemo resistant Subclones Identified by Single-Cell Transcriptomic Profiling in Sarcomas	Dr Parisa Ferdowsi Ferdowsi A/Prof Belamy Cheung
Project 9	Developing Combination Therapies with Novel MYC/MYCN Inhibitors for Aggressive Paediatric Brain Cancers	Dr Satyanarayana Gadde A/Prof Belamy Cheung
Project 10	A high-fat environment as a mechanism of initiation and progression of MYCN-driven medulloblastoma	Dr Ritu Mittra A/Prof Belamy Cheung
EXPERIMENTAL THERAPEUTICS & MOLECULAR ONCOLOGY GROUP		
Project 11	Identifying synergistic combination therapy for venetoclax in neuroblastoma	A/Prof Jamie Fletcher Dr Alvin Kamili Dr Jayne Murray
Project 12	Pre-emptive targeted therapy to optimise high-risk neuroblastoma treatment	A/Prof Jamie Fletcher Dr Alvin Kamili Dr Jayne Murray
Project 13	Novel combination therapies for child, adolescent and young adult sarcoma	Prof Michelle Haber Prof Murray Norris A/Prof Jamie Fletcher Dr Jayne Murray
Project 14	Combining targeted therapies and immunotherapies to develop better treatments for childhood cancers	Dr Klaartje Somers Dr Mawar Karsa
Project 15	Targeting metabolism to mitigate immunotherapy resistance in poor outcome leukaemia	Dr Klaartje Somers Dr Mawar Karsa
Project 16	Exploiting immunomodulatory anticancer agents to reduce metastatic spread in childhood cancers	Dr Klaartje Somers Dr Mawar Karsa
LEUKAEMIA BIOLOGY GROUP		
Project 17	Developing novel targeted therapeutics for the treatment of paediatric acute lymphoblastic leukaemia	Dr Sara Mohamed Prof Richard Lock
Project 18	Evaluating novel therapeutics for treating paediatric acute myeloid leukaemia	Dr Patrick Connerty Prof Richard Lock

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Project Number	Project Name	Supervisors
Project 19	Transcriptomic profiling for predictive biomarkers of drug response in childhood acute lymphoblastic leukaemia	Dr Christopher Smith Prof Richard Lock
Project 20	Investigating the role of long non-coding RNAs in paediatric acute myeloid leukaemia	Dr Patrick Connerty Prof Richard Lock
TRANSLATIONAL TUMOUR BIOLOGY GROUP		
Project 21	Integrative data analysis: from novel biomarker-drug response associations to predicting effective drug combinations	Dr Emmy Dolman A/Prof Paul Ekert
Project 22	Novel drug combination bullets for improved targeting of oncogenic signaling pathways driving high-risk paediatric cancer	Dr Emmy Dolman TBC
Project 23	The Functional Genomics of Molecular Targets in Paediatric Cancer	A/Prof Paul Ekert Dr Pei Liu
TRANSLATIONAL CANCER NANOMEDICINE GROUP		
Project 24	Engineering childhood cancer models for precision medicine	Prof Maria Kavallaris Dr Anna Guller
Project 25	Investigating immune cell reprogramming mRNA nanotherapeutics in immunocompetent models of paediatric brain and neuronal cancers	Dr Ernest Moles Prof Maria Kavallaris Dr Maria Tsoli
Project 26	5-ALA-Assisted Low-Dose Radiotherapy for Inoperable Paediatric Brain Tumours	Dr Anna Guller Prof Maria Kavallaris
Project 27	Non-Invasive Physical Treatments for Paediatric Brain Cancers	Dr Anna Guller Prof Maria Kavallaris
CANCER TARGETS AND THERAPEUTICS GROUP		
Project 28	Specific Targeting of Tumour-Promoting Cancer-Associated Fibroblasts in Pancreatic Cancer	Dr Angelica Merlot Prof Minoti Apte
Project 29	Examining the Surfaceome of Brain Cancer Cells to develop novel therapeutics	Dr Angelica Merlot A/Prof Tushar Kumeria
Project 30	Targeting polyamines to eradicate the root of relapse in neuroblastoma	Dr Angelica Merlot Dr Klaartje Somers

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BRAIN TUMOURS GROUP

Group Leader: Professor David Ziegler
Senior Scientist: Dr Maria Tsoli
Senior Scientist: Dr Ben Rayner

Project 1

Project Title: **Targeting Protein Citrullination for the treatment of Medulloblastoma**
Supervisor: Dr Ben Rayner brayner@ccia.org.au
Dr Aaminah Khan akhan@ccia.org.au
Suitable for: Honours or ILP
Project outline:

Medulloblastoma is the most common malignant brain tumour in children, constituting nearly 20 percent of all paediatric brain tumours. Citrullination is the irreversible conversion of arginine amino acid residues into citrulline by the Peptidylarginine deiminase (PAD) family of enzymes. PADs are upregulated in paediatric brain tumours, where citrullination leads to protein conformational changes, which disrupts amino acid and protein-protein interaction, leading to signalling pathway activation and tumorgenicity.

We have exciting preliminary data that shows that PAD activity and resultant citrullination is involved in Diffuse Midline Glioma tumorigenicity and that pharmacological inhibition of PAD is cytotoxic and decrease clonogenic potential within this paediatric brain tumour. This project aims to recapitulate these findings within the setting of medulloblastoma.

This project will assess the ability of pharmacological inhibitors of PAD to halt medulloblastoma tumorgenicity. Techniques employed will include medulloblastoma in vitro culture, cytotoxicity and clonogenic assays, qPCR, western blotting, and flow cytometry.

COMPUTATIONAL BIOLOGY GROUP

Group Leader & Deputy Director (Enabling Platforms + Collaboration): A/Professor Mark Cowley

Project 2

Project Title: **The onco-mitochondrial landscape of childhood cancer**
Supervisor: Dr Piyushkumar Mundra PMundra@ccia.org.au
A/Prof Mark Cowley mcowley@ccia.org.au
Suitable for: PhD Students
Project outline:

Mitochondria play a critical role in cellular energy production and various metabolic functions. Compared to nuclear genome in humans (~3.3 billion base pairs), the mitochondrial genome is a small, circular DNA molecule comprising 16,569 base pairs, encoding essential genes, transfer RNAs (tRNAs), and ribosomal RNAs (rRNAs). Each mitochondrion harbors multiple copies of mitochondrial DNA (mtDNA), and a single cell can contain hundreds to thousands of mitochondria—resulting in several thousand copies of the mitochondrial genome per cell. Pathogenic variants in mtDNA can occur in all copies (homoplasmy) or in only a subset (heteroplasmy). Numerous studies have linked mtDNA alterations to tumorigenesis in adult cancers. However, genomes of paediatric cancers are very different from adult cancers with different cell of origin. Hence understanding role of mtDNA alterations in pan-paediatric cohort is an important research question that remains unexplored till date.

Leveraging samples from Australia's largest paediatric precision oncology initiative—the ZERO Childhood Cancer Program—we have performed whole-genome sequencing on over 2,000 tumour-normal paired samples. For this project, our first aim is to create a comprehensive landscape of mtDNA-specific somatic and germline alterations across various paediatric cancers. Our laboratory has developed a bioinformatics pipeline, mity, to detect germline mtDNA variants. We plan to expand this pipeline to incorporate somatic mutations, as well as mtDNA copy number and structural variants.
In addition to genomic data, we have access to extensive clinical and molecular datasets from ZERO participants,

including pathogenic and likely pathogenic alterations in the nuclear genome, as well as RNA expression and methylation profiles. We will aim to perform integrative enrichment analyses comparing tumours with and without mtDNA alterations. Furthermore, with data from over 100 patients with multiple tumour samples, we aim to study the evolutionary dynamics of mtDNA alterations over time and in response to therapeutic interventions.

To further enhance our resolution of mitochondrial genomic variation, we will employ long-read sequencing technologies such as Oxford Nanopore. These technologies produce reads spanning several kilobases, allowing the entire mitochondrial genome to be sequenced in a single or few reads. This approach will improve the accuracy of variant detection, especially in regions with high homopolymer content. We plan to sequence tumour samples from a range of paediatric cancer types using this method, generating a unique dataset that will support the development of novel computational tools for identifying somatic mtDNA alterations.

The PhD candidate will be based in the Computational Biology Laboratory at the Children's Cancer Institute, Sydney. They will benefit from access to world-class computational infrastructure, unique datasets, and strong interdisciplinary support from a team of experienced researchers and engineers.

MOLECULAR DIAGNOSTICS GROUP

Principal Scientist: A/Prof Michelle Henderson

Project 3

Project Title: **Advancing and Refining Molecular Monitoring for Children with Leukaemia**
Supervisor: A/Prof Michelle Henderson mhenderson@ccia.org.au
Dr Toby Trahair Toby.trahair@health.nsw.gov.au
Suitable for: Honours, ILP or PhD Students
Project outline:

In acute lymphoblastic leukaemia (ALL), the amount of malignant cells that remain in the bone marrow after chemotherapy, referred to as minimal or measurable residual disease (MRD), is highly prognostic of clinical outcome. In ALL, molecular monitoring of MRD is typically achieved through periodic sampling of the bone marrow at specific timepoints during treatment and is widely used to help predict relapse and to tailor therapy for individual patients. These analyses typically involve quantitative PCR based on leukaemia-specific IG/TCR gene rearrangements for each patient. However, using conventional methods, these are time-consuming to develop and not achievable for all patients or patients with non-lymphoid leukaemia, such as acute myeloid leukaemia (AML).

The Project:
Recent technological developments provide opportunities to improve the coverage and quality of molecular PCR-based MRD testing and offer the prospect of less invasive approaches. This project will leverage data available through the ZERO personalised medicine program.

Our research has shown that next generation whole genome sequencing (WGS) data derived from leukaemia samples collected at diagnosis provides a reliable source of novel PCR-based markers. The data from WGS of paediatric leukaemia samples will be used to identify alternative genomic breakpoints (other than IG/TCR genes) that can be used to design robust leukaemia-specific qPCR-based tests and thereby enable MRD monitoring for a wider range of leukaemia patients. These will be validated against MRD results based on conventional tests for these leukaemias.

Further study will reveal whether minimally invasive approaches to sampling, i.e liquid biopsy, are an effective substitute to bone marrow sampling in paediatric acute leukaemia (refer to project "Liquid Biopsy for Molecular Monitoring of Early Relapse in Children with Leukaemia").

Possible project outcomes:
- Validation of new methods for MRD test development as a precursor for translation to clinical practice
- Expansion of MRD testing to a wider range of leukaemias, and ultimately other cancers
- Insight into the evolution of resistant disease

Skills gained:
- Knowledge of leukaemia biology and clinical management of leukaemia in children
- Handling, visualisation and interpretation of next generation sequencing data
- qPCR assay design and laboratory based application
- Statistical analysis of clinical data.

Project 4

Project Title: **Liquid Biopsy for Molecular Monitoring of Early Relapse in Children with Leukaemia**
Supervisor: Dr Michelle Henderson mhenderson@ccia.org.au
Dr Narges Bayat nbayat@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:
In acute lymphoblastic leukaemia (ALL), the amount of malignant cells that remain in the bone marrow after chemotherapy, referred to as minimal or measurable residual disease (MRD), is highly prognostic of clinical outcome. In ALL, molecular monitoring of MRD is typically achieved through periodic sampling of the bone marrow at specific timepoints during treatment and is widely used to help predict relapse and to tailor therapy for individual patients. These analyses typically involve quantitative PCR based on leukaemia-specific IG/TCR gene rearrangements for each patient, but using conventional methods, these are time-consuming to develop and not achievable for all patients or patients with non-lymphoid leukaemia, such as acute myeloid leukaemia (AML). Moreover, bone marrow biopsy is an invasive procedure that cannot inform about relapses in other organs. Therefore, there is a clinical need for a minimally invasive but equally sensitive method to detect early relapse and to improve the coverage and quality of molecular MRD testing. Recent studies demonstrate that liquid biopsy—measuring circulating nucleic acids in peripheral blood—offers a minimally invasive approach for monitoring early relapse in solid cancers. In this project, by applying whole genome sequencing (WGS) to primary leukaemia samples, highly sensitive assays will be developed to detect circulating tumour DNA (ctDNA) in blood, enabling real-time tracking of leukaemia response to therapy and potentially identifying MRD earlier than traditional methods. The efficacy of this approach will be evaluated by comparing results against established conventional MRD testing methods to assess its clinical utility.

Possible project outcomes:
- Determination of the feasibility of minimally invasive MRD monitoring
- Revelation of the biology of ctDNA in childhood leukaemia
- Insight into the evolution of resistant disease

Skills gained:
- Knowledge of leukaemia biology and clinical management of leukaemia in children
- Handling, visualisation and interpretation of next generation sequencing data
- Sample processing for extraction of genomic and cell-free DNA
- qPCR assay design and laboratory based application
- Statistical analysis of clinical data.

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SARCOMA BIOLOGY AND THERAPEUTICS GROUP

Team Leader: A/Prof Emmy Fleuren

Project 5

Project Title: **Discovering actionable drug targets for young patients with sarcoma through phosphoproteomics**

Supervisor: A/Prof Emmy Fleuren efleuren@ccia.org.au
TBA

Suitable for: Honours, ILP or PhD Students

Project outline:

Sarcomas are a diverse group of highly aggressive tumours that disproportionally affect the young. Despite aggressive treatments, survival is limited (~20% in advanced setting) and side-effects frequently occur, stressing the unmet need to identify better and kinder treatments. Pinpointing clinically actionable targets is however extremely challenging in these tumours. Although genomic data interrogation has revolutionised cancer therapies, it often does not identify a targeted treatment for young sarcoma patients.

Tumour genomics are however only one piece of the puzzle, and the picture they paint is incomplete. Our team has generated compelling data that when we couple a phosphoproteomics approach (to identify novel and activated drug targets at the protein level) to a robust preclinical functional validation framework (where we test *in vitro* and *in vivo* if drugs that 'switch off' those newly identified targets truly inhibit sarcoma growth), this can aid clinical decision-making. Our earlier phosphoproteomic discovery already influenced clinical drug recommendations for selected young sarcoma patients, where a young patient had tumour shrinkage while treated with a novel drug our team recommended. Now, more research is needed to make new drugs a treatment reality for more young sarcoma patients.

We have an excellent opportunity for a PhD/Honours student to join our young and dynamic team and dive into this project. You will study the phosphorylation patterns in sarcoma patient samples, aiming to identify novel, clinically actionable targets for young sarcoma patients that are currently missing out. You will work closely with the ZERO Childhood Cancer program (ZERO), which is Australia's nationwide precision medicine program aimed to identify a personalised, targeted treatment for all children with cancer (including those with sarcoma). You will use a variety of molecular methodologies, including Mass-Spectrometry and targeted phosphoproteomic assays (e.g. Kinome Profiler/Western Blot/Immunohistochemistry). Functional relevance of identified targets will be validated using *in vitro* (drug screens/siRNA/CRISPR) and *in vivo* (drug efficacy) sarcoma models; exact techniques depend on Honours/PhD level.

Results have the potential to have a clinical impact on sarcoma patients in ZERO.

Project 6

Project Title: **Finding better and kinder treatments for young patients with osteosarcoma and beyond**

Supervisor: A/Prof Emmy Fleuren efleuren@ccia.org.au
TBA

Suitable for: Honours, ILP or PhD Students

Project outline:

There is an unmet need to identify better and kinder treatments for young people with osteosarcoma. Osteosarcoma is an aggressive and difficult-to-treat type of cancer that disproportionally affects the young. Treatments have not changed much over the past four decades, and still consist of surgery (often amputation), high dose chemotherapy and sometimes radiotherapy. Side-effects are frequent, and despite this intense treatment, still not everyone makes it. The expected chance of survival is less than 20% when the tumour is metastasized, which is not uncommon at diagnosis.

We recently established 8 unique patient-derived osteosarcoma cell models, and by testing a range of novel drugs on these cells, found a promising new drug to treat osteosarcoma. While this drug was on its own already stopping the growth of osteosarcoma cells grown in a dish in the lab ('in vitro'), and even stopped the growth of real mini human osteosarcoma tumours grown in mouse avatars ('in vivo'), a combination of this drug with another targeted drug was even more effective and very tolerable. Excitingly, our latest data suggests this combination may also work for other aggressive sarcomas, thereby vastly extending the impact of our work. In some instances, we even observed complete

tumour regressions.

Now, more work is needed to truly pinpoint who is most likely to benefit from this novel (combination) treatment. We need to 1) understand why and how these drugs work, and 2) test our drugs in more sarcoma avatar models, which represent the 'gold standard' of drug testing. This is the type of evidence we need to generate to make new drugs a treatment reality for young sarcoma patients.

We have an excellent opportunity for a PhD/Honours student to join our young and dynamic team and dive into this project. You will work closely with the ZERO Childhood Cancer program (ZERO), which is Australia's nationwide precision medicine program aimed to identify a personalised, targeted treatment for all children with cancer (including those with sarcoma). You will use a variety of research techniques, such as phosphoproteomics, Western Blot, functional knock-out/down (e.g. CRISPR/siRNA), immunohistochemistry, in vitro drug assays, and when applicable in vivo studies. Exact techniques depend on Honours/PhD level.

Results have the potential to have a clinical impact on sarcoma patients in ZERO.

EMBRYONAL CANCER THERAPY AND PREVENTION GROUP

Group Leader: Professor Glenn Marshall
Principal Scientist: A/Professor Belamy Cheung

Project 7

Project Title: **A Systematic and Multi-Modal Framework to Identify and Target Metabolic Vulnerabilities Following Chemotherapy in Childhood Cancers**
Supervisor: Dr Kenny Yeo kyeo@ccia.org.au
A/Prof Belamy Cheung bcheung@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:
Chemotherapy remains a cornerstone in the treatment of childhood cancers, yet its long-term effectiveness is limited by tumour relapse, resistance, and the emergence of secondary malignancies. Increasing evidence suggests that chemotherapy induces persistent alterations in tumour metabolism, which may create exploitable therapeutic vulnerabilities. This project will adopt a systematic and multi-modal approach to investigate metabolic changes that occur in childhood cancers following chemotherapy. The overarching goal is to identify conserved, targetable metabolic pathways that could be leveraged to improve treatment outcomes and reduce the risk of relapse.

The project will begin with a systematic review and meta-analysis of existing studies reporting chemotherapy-induced metabolic changes in paediatric tumours. Using standardised methodologies, this review will synthesise findings across both preclinical and clinical studies to provide a foundational map of chemotherapy-related metabolic reprogramming. Genomic and transcriptomic datasets identified through this review, together with our existing scRNA datasets, will then be analysed to uncover metabolic signatures characteristic of post-chemotherapy tumour states. Through integrative bioinformatics analyses, we will uncover key metabolic vulnerabilities and nominate candidate therapeutic targets that are consistently altered following chemotherapeutic exposure. These findings will be experimentally validated using our deconstructed chemotherapeutic model in vitro. Cancer cell lines will be exposed to clinically relevant chemotherapy agents, and resulting metabolic changes will be characterised. Functional assays will then be used to evaluate potential therapeutic vulnerabilities, including drug sensitivity screening and pathway inhibition. Finally, selected metabolic targets will be validated in vivo using xenograft or patient-derived models to assess their therapeutic potential in combination with standard chemotherapy. Overall, this project aims to bridge systematic evidence synthesis with experimental validation to uncover novel post-chemotherapy metabolic vulnerabilities in childhood cancers, ultimately informing future therapeutic strategies to reduce relapse and improve clinical outcomes.

Supervision and Research Environment: The project will be supervised by Dr Kenny Yeo, an early-career researcher with expertise in both wet-lab and bioinformatics approaches, and experience mentoring Honours, Master's, and PhD students. Additional supervision and guidance will be provided by A/Prof Belamy Cheung and Prof. Glenn Marshall, both of whom bring extensive experience in paediatric cancer research at the Children's Cancer Institute. The student will be embedded within the Embryonal Cancer Therapy and Prevention Group, led by Prof. Marshall, a leading

paediatric oncologist with a strong translational focus, ensuring the project remains clinically relevant and impact-driven.

Project 8

Project Title: **Therapeutic Targeting of Chemo resistant Subclones Identified by Single-Cell Transcriptomic Profiling in Sarcomas**

Supervisor: Dr Parisa Ferdowsi Ferdowsi pvahidi@ccia.org.au
A/Prof Belamy Cheung bcheung@ccia.org.au

Suitable for: Honours, ILP or PhD Students

Project outline:

Most childhood, adolescent, and young adult (AYA) sarcoma patients achieve clinical remission through a "one-size-fits-all" chemotherapy regimen based on histological subtype. However, approximately one-third of these patients experience relapse, and the majority of those will ultimately die from the disease. This underscores an urgent need for accurate predictive assays to identify patients at risk of relapse.

Longitudinal studies have revealed the presence of minor sub clonal cancer populations at diagnosis that persist through early chemotherapy and later contribute to disease recurrence. The advent of single-cell RNA sequencing (scRNA-seq) has enabled high-resolution insight into the transcriptomic profiles of these rare subclones.

At Embryonal Cancer Therapy and Prevention Group at Children's Cancer Institute we have established a high-throughput droplet-based scRNA-seq platform to investigate intratumoral and intertumoral heterogeneity in osteosarcoma. Using proof of principle experiments on matched pre- and post-chemotherapy osteosarcoma samples, we identified an enrichment of chemo resistant subclones, some of which exhibit potential sensitivity to therapeutic agents not currently employed in standard treatment protocols. To further refine our ability to identify tailored therapies for osteosarcoma patients, we are expanding our capabilities to include single-nucleus RNA sequencing (snRNA-seq) and spatial transcriptomics (sRNA-seq).

Our study integrates cutting-edge scRNA-seq and whole-exome sequencing (WES) with advanced bioinformatics, large-scale public datasets, and unique clinical resources to address fundamental questions regarding the role of chemotherapy-resistant subclones in shaping individual patient outcomes.

Techniques and key outcomes /learnings:
The Higher Degree Research candidate will gain expertise in cutting-edge cellular and molecular techniques to investigate the hypothesis that changes in genomic and transcriptomic profiles among residual malignant cells during early chemotherapy reflect subclonal selection associated with chemoresistance and relapse.

Techniques and key outcomes /learnings:
- scRNA-seq, snRNA-seq, and sRNA-seq.
- Tissue culture
- Forward genetics using gene overexpression, knockdown and knockout.
- Cellular and molecular techniques including flow cytometry, RT-PCR and immunoblotting.
- Experience in working with patient-derived xenograft models of sarcoma.
- Data analysis and bioinformatics.
- Critical thinking and hypothesis testing.

Project 9

Project Title: **Developing Combination Therapies with Novel MYC/MYCN Inhibitors for Aggressive Paediatric Brain Cancers**

Supervisor: Dr Satyanarayana Gadde sgadde@ccia.org.au
A/Prof Belamy Cheung bcheung@ccia.org.au

Suitable for: Honours, ILP or PhD Students

Project outline:

Project Overview:
This research project provides PhD, Honours, and ILP students with the opportunity to contribute to groundbreaking

research focused on childhood brain cancers, specifically medulloblastoma (MB) and diffuse intrinsic pontine glioma (DIPG). MB is the most common malignant brain tumour in children, while DIPG is one of the most aggressive, with a survival rate under 1% and no effective therapies. Both cancers are driven by MYC/MYCN oncoproteins, making them prime targets for novel therapies. The project aims to investigate the effectiveness of combining newly developed MYC/MYCN inhibitors with approved drugs to enhance treatment outcomes.

What You'll Do:
As a student involved in this project, you will engage in cutting-edge cancer research by testing new drug combinations on cancer cell lines. You will:

- Evaluate how MYC/MYCN inhibitors, in combination with existing therapies, impact cell growth, apoptosis, and MYCN/c-MYC expression in MB and DIPG cells.
- Conduct molecular assays to uncover the mechanisms behind how these drug combinations work.
- Contribute to the development of new treatment strategies for high-risk paediatric cancers, with potential for future clinical applications.

You will gain hands-on experience with advanced research techniques in molecular biology, pharmacology, and cancer biology, and work alongside a team of experts at the Children's Cancer Institute.

Why Join This Project?
This opportunity offers unique training for Honours and PhD students interested in pursuing high-impact cancer research. For ILP students, the project provides practical exposure to real-world research in cancer therapeutics. This research project will be supervised by a team of experts, including Dr Satyanarayana Gadde, an experienced researcher with a strong track record of mentoring students and producing high-impact research, and Associate Professor Belamy Cheung, an expert in paediatric cancer research. Together with Professor Glenn Marshall, a clinician-scientist with a focus on translational research, we form a highly collaborative and supportive team dedicated to advancing innovative therapies for childhood cancers.

The Impact of Your Work:
Your research will directly contribute to the development of therapies for children with MB and DIPG, potentially transforming the clinical landscape for these cancers. This project has the potential to lead to clinical trials and make a significant difference in paediatric oncology.

Why It Matters:
By joining this project, you will be part of transformative research with the potential to improve survival rates for children with some of the most challenging cancers. Whether you're an Honours, PhD, or ILP student, this opportunity will provide you with invaluable research experience and a chance to make a real impact in the fight against childhood cancer.

Project 10

Project Title: **A high-fat environment as a mechanism of initiation and progression of MYCN-driven medulloblastoma**

Supervisor: Dr Ritu Mittra sgadde@ccia.org.au
A/Prof Belamy Cheung bcheung@ccia.org.au

Suitable for: Honours or ILP Students

Project outline:

Project Summary: This Honours research project will investigate whether exposure to a high-fat environment accelerates medulloblastoma development, like findings recently observed in neuroblastoma models by our group. The project specifically focuses on the interaction between the MYCN oncogene, a known driver in both neuroblastoma and medulloblastoma, and a high-fat prenatal environment, mimicking maternal obesity. Medulloblastoma is the most common malignant paediatric brain tumour and a leading cause of cancer-related mortality in children. Relapsed medulloblastoma has extremely poor survival outcomes, underscoring the urgent need to understand the early drivers of disease. Our work in neuroblastoma showed that high-fat conditions in early development accelerates MYCN-driven oncogenesis. This project will test whether a similar mechanism exists in medulloblastoma using in vitro models.

The student will work primarily with medulloblastoma cell lines and compare the cellular and molecular responses of these cells in normal versus high-fat environments. Key analyses will include changes in proliferation, MYCN

expression, lipid metabolism, and gene expression profiles indicative of tumour progression or transformation. If parallels are observed between neuroblastoma and medulloblastoma, this would support a broader paradigm of prenatal gene-environment interactions in embryonal tumour development.

Supervision and Research Environment: The project will be supervised by Dr Ritu Mittra, an experienced and dedicated researcher who has successfully co-supervised multiple HDR students with Associate Professor Belamy Cheung. Dr Mittra's last two Honours students were both awarded High Distinction, reflecting the high quality of mentorship and student support. The student will also be embedded within the laboratory of Professor Glenn Marshall at the Children's Cancer Institute. Prof Marshall is a leading paediatric oncologist with a strong translational focus, ensuring the research remains aligned with potential clinical impact.

Significance and Impact: Childhood cancer remains a major global health issue, with neuroblastoma and medulloblastoma accounting for a disproportionate number of cancer-related deaths in children. There is increasing evidence that gene-environment interactions in the prenatal period may contribute to cancer risk, yet the molecular mechanisms remain poorly understood. By exploring how a high-fat environment influences MYCN-driven medulloblastoma, this project addresses a critical knowledge gap. Understanding these mechanisms may lead to transformative strategies in early prevention, such as maternal dietary interventions, prenatal lipid screening, and the identification of epigenetic biomarkers of cancer risk. Given that maternal obesity affects over 30% of pregnancies globally, the potential to inform public health strategies and clinical interventions is substantial. This project could therefore yield findings of considerable scientific and societal importance, contributing to the broader goal of reducing childhood cancer incidence and improving outcomes for affected families.

EXPERIMENTAL THERAPEUTICS & MOLECULAR ONCOLOGY GROUP

Group Leader and Executive Director: Professor Michelle Haber
Group Leader: Professor Murray Norris
Principal Scientist + A/Professor: Jamie Fletcher
Senior Scientist: Dr Klaartje Somers

The aim of the Experimental Therapeutics Group is to develop more effective, targeted treatments for childhood solid tumours, with a particular focus on neuroblastoma – a cancer of embryonal neural crest cells and the most common solid tumour of early childhood. Children with neuroblastoma often present with advanced disease, and even with intensive therapies, many do not survive.

Most cancer chemotherapeutics are also highly toxic to normal tissues. Because of this lack of specificity, many childhood cancer survivors experience serious health problems in adulthood. There is an urgent need for targeted drugs with a high specificity for cancer cells and low toxicity for the normal growing tissues of a child.

Developing targeted treatments requires the identification and validation of molecular targets, and the technology and capability to translate that knowledge into drug discovery, preclinical testing, and clinical trials. This is the focus of our group. We use a variety of techniques including primary cell culture, cytotoxic assays, drug screening, drug testing in mice, genomic and transcriptomic analyses, histopathology and tissue microarray.

Project 11

Project Title: **Identifying synergistic combination therapy for venetoclax in neuroblastoma**
Supervisor: A/Prof Jamie Fletcher jfletcher@ccia.org.au
Dr Alvin Kamili akamili@ccia.org.au
Dr Jayne Murray jmurray@ccia.org.au
Suitable for: Honours Students
Project outline:
Venetoclax, a specific inhibitor of the pro-survival protein BCL2, is proving effective against a range of cancers. Our studies and those of others suggest that venetoclax combination therapy may also be effective against high-risk neuroblastoma. We are assessing new venetoclax combinations using clinical-trial like approaches in a cohort of patient-derived laboratory models of neuroblastoma, pursuing the discovery of biomarkers of drug activity, and

assessing mechanisms of drug resistance. Our studies are designed to generate the evidence required to support subsequent clinical trials and has potential to directly impact on survival rates.

Project 12

Project Title: **Pre-emptive targeted therapy to optimise high-risk neuroblastoma treatment**
Supervisor: A/Prof Jamie Fletcher jfletcher@ccia.org.au
Dr Alvin Kamili akamili@ccia.org.au
Dr Jayne Murray jmurray@ccia.org.au
Suitable for: Honours, Masters or PhD Students
Project outline:

Nearly 50% of children diagnosed with high-risk neuroblastoma still experience relapse or have refractory disease, for which there is no cure. Despite numerous early phase clinical trials, overwhelmingly conducted in relapsed/refractory patients, their outcome remains especially poor, and <10% survive beyond 5 years.

The current treatment paradigm, where patients receive targeted/experimental therapies after failing standard-of-care treatment, is clearly inadequate, with potentially active treatments being introduced too late to meaningfully improve survival. In relapsed/refractory neuroblastoma, recurrent mutations have been identified in >50% tumours, with mutations concentrated in a small number of pathways, including RAS-MAPK, ALK, FGFR and P53/MDM2, suggesting that activation of a limited number of pathways allows HR-NB to survive non-targeted, cytotoxic chemotherapy. In this study, we are generating robust pre-clinical evidence to demonstrate the impact of earlier, pre-emptive intervention with targeted agents in clinically relevant, patient-derived models of newly diagnosed, untreated neuroblastoma.

Project 13

Project Title: **Novel combination therapies for child, adolescent and young adult sarcoma**
Supervisor: Prof Michelle Haber MHaber@ccia.unsw.edu.au
Prof Murray Norris MNorris@ccia.org.au
A/Prof Jamie Fletcher jfletcher@ccia.org.au
Dr Jayne Murray jmurray@ccia.org.au
Suitable for: Honours or PhD Students
Project outline:

We have developed a series of novel therapies targeting child cancer driver signals in sarcoma: polyamine metabolism using DFMO/AMXT1501; chromatin conformation using FACT inhibitor CBL0137; nicotinamide metabolism with inhibitor OT-82; arginine dependency using pegylated arginase BCT-100. We use unbiased high-throughput combination to identify synergy with established oncology drugs. Effective combinations will be validated in vivo in our internationally unique panel sarcoma PDX models. For biomarker identification, PDX response scores will be integrated with RNA seq and genomic datasets from sarcoma patients to identify differentially expressed genes, enriched pathways and molecular aberrations in responders.

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Project 14

Project Title: **Combining targeted therapies and immunotherapies to develop better treatments for childhood cancers**

Supervisor: Dr Klaartje Somers ksomers@ccia.org.au
Dr Mawar Karsa mkarsa@ccia.org.au

Suitable for: Honours or PhD Students

Project outline:

Despite intensive multimodal therapies for children with solid cancers including neuroblastoma and sarcoma, resistance to current standard-of-care treatments remains a major hurdle. While immunotherapies have shown promise in some cancers, their efficacy in childhood solid tumours is limited, partly due to these tumours employing diverse immune evasion mechanisms to hide from the immune system and to develop an immunosuppressive tumour microenvironment.

We previously discovered that several targeted anticancer agents with efficacy against childhood cancer models have immunomodulatory effects and can stimulate T cell infiltration into solid tumours. We hypothesise that we can exploit the immunomodulatory effects of these novel agents to re-educate the immune system in solid tumours and to enhance the efficacy of immunotherapies.

In this project, students will:

1. Perform an in-depth spatial assessment of the immunomodulatory effects of novel targeted anti-cancer drugs in models of childhood solid cancers, including neuroblastoma sarcoma and leukaemia
2. Determine the ability of these novel anticancer drugs to increase the efficacy of immune checkpoint inhibitors in models of childhood solid cancers
3. Determine the ability of these novel anticancer drugs to increase the efficacy of CAR-T cells in models of childhood solid cancers

Project 15

Project Title: **Targeting metabolism to mitigate immunotherapy resistance in poor outcome leukaemia**

Supervisor: Dr Klaartje Somers ksomers@ccia.org.au
Dr Mawar Karsa mkarsa@ccia.org.au

Suitable for: Honours or PhD Students

Project outline:

Acute myeloid leukaemia (AML) remains a highly fatal blood cancer in children. One-third of children with AML relapse due to treatment resistance, with only 30% of relapsed patients surviving their disease. Resistance to standard of care treatment is thus a major challenge within the AML field. In addition, current treatment protocols often cause detrimental short-term and long-term health effects, sometimes even treatment-induced death. Furthermore, immunotherapies, while highly successful in B-cell acute lymphoblastic leukaemias, have so far yielded disappointing results in AML, due at least in part to the presence of an immunologically dysfunctional bone marrow microenvironment. There is thus an urgent need to develop better and safer treatments for AML and to overcome resistance to both standard of care treatment and immunotherapeutic approaches.

Our group previously demonstrated the anticancer effects of several anticancer agents that target cancer metabolism in animal models of AML. As it is becoming increasingly clear that aberrant cancer metabolism contributes to treatment resistance and to immune evasion and generation of an immunosuppressive tumour microenvironment. We hypothesise that dysregulated leukaemia metabolism plays a key role in generating and maintaining the dysfunctional bone marrow microenvironment that supports treatment resistance and limits the efficacy of immunotherapies. Exploiting anticancer targets that can reprogram leukaemia metabolism may provide a means to enhance standard of care and immunotherapies for AML. In this project, students will:

1. Identify novel effective treatments combining metabolism-targeting agents with FDA-approved agents for paediatric AML
2. Investigate the potential of novel metabolism-targeting anticancer agents to potentiate immunotherapies in acute leukaemia models

Project 16

Project Title: **Exploiting immunomodulatory anticancer agents to reduce metastatic spread in childhood cancers**
Supervisor: Dr Klaartje Somers ksomers@ccia.org.au
Dr Mawar Karsa mkarsa@ccia.org.au
Suitable for: Honours or PhD Students
Project outline:
Metastasis presents a major clinical challenge in the management of childhood cancers. The paucity in development of appropriate animal models for preclinical testing of anti-metastasis agents contributes to the difficulty to develop effective antimetasis therapeutic approaches.

There is increasing evidence that tumour-induced immune evasion mechanisms play a key role in the development and persistence of childhood cancer metastases. We hypothesise that anticancer agents that also possess immunomodulatory capacity, can normalise the systemic immune system in patients and can thereby suppress metastatic spread.

In this project, students will:
1. Develop a metastatic mouse model for neuroblastoma, the most common extracranial tumour in children
2. Assess the potential of several immunomodulatory anticancer agents to attenuate metastatic spread in a metastatic neuroblastoma model
3. Assess the potential of several immunomodulatory anticancer agents to attenuate metastatic spread in a metastatic sarcoma model.

LEUKAEMIA BIOLOGY GROUP

Group Leader and Theme Head (Cancer Biology): Professor Richard Lock
Senior Research Officer: Dr Patrick Connerty
Senior Research Officer: Dr Narges Bayat

Project 17

Project Title: **Developing novel targeted therapeutics for the treatment of paediatric acute lymphoblastic leukaemia**
Supervisor: Dr Sara Mohamed smohamed@ccia.org.au
Prof Richard Lock rlock@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:
Philadelphia Chromosome like acute lymphoblastic leukaemia (Ph-like ALL) is a recently identified blood cancer with poor survival rates. These patients lack optimal treatment options and treatment with standard chemotherapy causes severe toxicity to healthy tissue. Targeted therapy is promising. However, the critical limitation of current targeted therapies against ALL is that they all target the same cell-surface proteins (antigens) on cancer cells. However, since these antigens are not functionally important, the cancer cells can escape treatment by removing them, thus becoming invisible to the therapeutic, leading to relapse. Moreover, these proteins are also expressed on both cancer and non-cancer cells, leading to side effects. There is an urgent need for new effective and safer targeted therapeutic approaches for the treatment of Ph-like ALL. We have addressed this challenge by targeting a cell-surface receptor that is vital for the survival of the Ph-like ALL cells. In this project, students will develop novel therapeutics including antibody-drug conjugates (ADCs) against this target for the effective and safe treatment of Ph-like ALL.

Techniques and key outcomes/learnings:
1. Site-specific conjugation of antibodies with chemotherapeutic drugs.
2. Optimisation of the ADC properties including linker chemistry and antibody subtype.
3. Cell and molecular techniques including cell cytotoxicity assays, flow cytometry, and confocal microscopy.
4. Characterisation of the ADC including drug to antibody ratio.
5. Experience in working with patient-derived xenograft models of ALL.

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Project 18

Project Title: **Evaluating novel therapeutics for treating paediatric acute myeloid leukaemia**
Supervisor: Dr Patrick Connerty pconnerty@ccia.org.au
Prof Richard Lock rlock@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:
Acute myeloid leukaemia (AML) is an aggressive blood cancer in children with poor survival rates, particularly for patients who relapse or do not respond to initial treatment. Current therapies rely heavily on intensive chemotherapy, which can cause severe side effects and lead to long-term health complications. There is an urgent need to develop safer and more effective treatments that can overcome drug resistance and improve outcomes for children with AML.

This project aims to identify and evaluate new therapeutic strategies for AML by combining molecular biology approaches, such as CRISPR Cas9 knockout and overexpression, flow cytometry, and high throughput drug screening with preclinical drug testing in highly translational models. Students will investigate how specific genes influence drug sensitivity and resistance and assess the potential of new therapies that could be rapidly translated into clinical use for paediatric AML patients.

Techniques and key outcomes /learnings:
1. Cas mediated gene overexpression, knockdown and knockout
2. Genome-wide and small library CRISPR/Cas screening *in vitro* and *in vivo*
3. Cell and molecular techniques including viral transduction, flow cytometry, RT-PCR, and immunoblotting
4. High-throughput drug screening of patient-derived xenograft and patient AML cells.
5. Experience in working with patient-derived xenograft models of AML

Project 19

Project Title: **Transcriptomic profiling for predictive biomarkers of drug response in childhood acute lymphoblastic leukaemia**
Supervisor: Dr Christopher Smith csmith@ccia.org.au
Prof Richard Lock rlock@ccia.org.au
Suitable for: Honours or ILP Students
Project outline:
Despite significant progress in treating acute lymphoblastic leukaemia (ALL), the most common childhood cancer, some patients don't respond well to standard-of-care therapy resulting in relapse and poor outcome. Personalised medicine programs, such as ZERO Childhood Cancer, leverage next-generation sequencing to tailor treatments for individual patients. However, the full potential of RNA sequencing (RNA-seq) remains largely untapped for predicting drug responses, despite its capacity to offer a dynamic view of the activity of complex biological pathways that likely drive therapeutic outcomes.

This project will employ bioinformatics and statistical approaches to integrate RNA-seq data with comprehensive drug response profiles from ALL models. Our primary aim is to identify novel gene signatures and dysregulated pathways that are robustly associated with drug sensitivity or resistance. The ultimate goal is to develop clinically actionable biomarkers that can accurately predict individual patient responses, allowing proactive tailoring of treatments for improved patient outcomes.

Some prior coding experience (e.g., Python or R) is beneficial for this project. However, we strongly encourage motivated students who are eager to develop computational skills to apply.

Techniques and key outcomes/learnings:
1. Genomics data processing using R scripting and high-performance computing clusters
2. Accessing and utilising public data repositories
3. RNA-seq analysis and interpretation
4. Presentation, writing, literature review skills

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Project 20

Project Title: **Investigating the role of long non-coding RNAs in paediatric acute myeloid leukaemia**
Supervisor: Dr Patrick Connerty pconnerty@ccia.org.au
Prof Richard Lock rlock@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:
Acute myeloid leukaemia (AML) is an aggressive blood cancer currently treated with intensive chemotherapy that kills both cancer and healthy blood cells leading to severe side effects and long-term health complications. Consequently, there is a need to identify molecular targets which are specific to AML and absent in healthy cells, allowing for a precision medicine approach to treat the disease. Long non-coding RNAs (lncRNAs) are a class of RNAs which have unique expression profiles in multiple cancers, including AML. Targeting lncRNAs therapeutically is a rapidly emerging field and presents an opportunity to specifically eradicate AML cells while sparing healthy blood cells. In this project, students will identify and investigate lncRNAs that are both specific and vital for AML cells and explore their potential as therapeutic targets.

Techniques and key outcomes/learnings:
1. Forward genetics using siRNA, shRNA, CAS13 knockdown and Cas9 knockout
2. Genome-wide and small library CRISPR/Cas screening in vitro and in vivo
3. Cell and molecular techniques including viral transduction, flow cytometry, RT-PCR and immunoblotting
4. Experience in bioinformatics analysis
5. Experience in working with patient-derived xenograft models of AML

TRANSLATIONAL TUMOUR BIOLOGY GROUP

Group Leader and Deputy Director (Research Themes): A/Professor Paul Ekert
Senior Scientist: Dr Emmy Dolman

Project 21

Project Title: **Integrative data analysis: from novel biomarker-drug response associations to predicting effective drug combinations**
Supervisor: Dr Emmy Dolman EDolman@ccia.org.au
A/Prof Paul Ekert pekert@ccia.org.au
Suitable for: Honours or PhD Students
Project outline:
More than 140 children with cancer die in Australia each year due to the occurrence of resistance to traditional chemotherapy. To improve overall survival rates for high-risk paediatric cancer patients, Children's Cancer Institute initiated the Zero Childhood Cancer national personalised medicine trial (PRISM). Within this trial, tumour biopsies from children with high-risk cancer are collected for full molecular profiling to identify cancer driver events and for the generation of patient-derived model systems to link these events to targeted therapies.

WGS, RNA-Seq and DNA methylation profiling of >350 tumour samples showed actionable events in only 70% of the patients. High-throughput drug testing on >150 patient-derived samples yielded unexpected efficacy patterns for single agent targeted drugs without an associated predictive biomarker, but clinical trials for paediatric cancer have proven that treatment with single agents is insufficient in most cases. The current study aims to integrate PRISM molecular profiling and in vitro drug efficacy datasets to identify novel biomarker-drug response associations and predict effective drug combinations for paediatric cancer by developing novel bioinformatic algorithms. Publicly available databases such as DepMap, CancerrXGene and NCI-ALMANAC that contain in vitro efficacy data for single drugs and drug combinations alongside molecular characterisation of the used model systems will be exploited for algorithm optimisation and deeper integrative analysis. Novel discovered biomarker-drug response associations and drug combinations will be validated in vitro and in vivo in patient-derived model systems to guide future clinical trials for paediatric cancer treatment.

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Project 22

Project Title: **Novel drug combination bullets for improved targeting of oncogenic signaling pathways driving high-risk paediatric cancer**

Supervisor: Dr Emmy Dolman EDolman@ccia.org.au
TBC

Suitable for: Honours or PhD Students

Project outline:

More than 140 children with cancer die in Australia each year due to the occurrence of resistance to traditional chemotherapy. The global effort to understand the molecular basis of high-risk paediatric cancers has unravelled several important signaling pathways frequently genetically altered, including Ras-MAPK, PI3K-Akt-mTOR, cell cycle, and DNA damage response. This has led to the clinical use of drugs targeting selective key players in these pathways such as trametinib inhibiting the Ras-MAPK key player MEK. However, clinical responses to many targeted drugs have been disappointing because of:
1) the challenge to accurately predict which patients might benefit from targeted therapies, and
2) the occurrence of resistance to single targeted drugs. The current study aims to identify improved predictive biomarkers and combination strategies to overcome resistance for clinically available drugs targeting key oncogenic signaling pathways driving high-risk paediatric cancers. We will make use of the unique resources available through the national Zero Childhood Cancer personalised medicine program, including WGS and RNA sequencing data for >600 tumour samples, in vitro drug response data for >150 tumour samples, and >150 patient-derived models. Biomarker identification and validation will be performed using technologies such as integrative data analysis, phosphoproteomics, and CRISPR gene editing. Novel drug combinations will be identified by in vitro high-throughput combination testing and genome-wide CRISPR screening. Novel discovered biomarker-drug response associations and drug combinations will be validated in vitro and in vivo in patient-derived model systems to guide future clinical trials for paediatric cancer treatment.

Project 23

Project Title: **The Functional Genomics of Molecular Targets in Paediatric Cancer**

Supervisor: A/Prof Paul Ekert pekert@ccia.org.au
Dr Pei Liu PLiu@ccia.org.au

Suitable for: PhD Student

Project outline:

Background: Cancer remains one of the deadliest diseases in children. Our Computational Drug Discovery Biology group and Translational Tumour Biology group work together on discovering novel gene targets for drug development in childhood cancers. This work leverages the remarkable genomic data available through the Zero Childhood Cancer Program (ZERO), the national precision medicine program for childhood cancer. The goal of this PhD project is to discover and experimentally validate molecular targets for drug discovery using the advanced tools of functional genomics, molecular and cellular biology.

Broadly, the research goals are to establish how selected molecular targets regulate cell survival and proliferation in paediatric cancer cells. The experimental approaches includes gene-knockout or knockdown system such as the RNA-guided Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) Cas9 and Cas13d. The assays that are used to read out the effects of gene perturbation include RT-PCR, western blotting, cell cytotoxicity, cell proliferation and clonogenicity assays. It may also include RNA-sequencing and quantitative proteomics analyses. Once it is established that a target has potential, the student will undertake further detailed molecular analyses to demonstrate in detail the molecular functions of the target gene in cancer cells, which enzymatic or other functions of the molecule are required for any oncogenic activity and what the consequences would be of disrupting those functions.

The student will have the opportunity to be involved in the development of assays to screen for possible small molecules to that could form the basis of future drug development. The student will develop skills in advanced skills in molecular biology and functional genomics. The student will also develop skills in computational biology and bioinformatics. They will work as part of the Translational Tumour Biology and Computational Drug Discovery groups. This is an ideal project for a student curious about the fundamental biological processes that drive the cancer phenotype, and a desire to learn how basic science can drive therapeutic discoveries.

CHILDREN'S CANCER INSTITUTE

TRANSLATIONAL CANCER NANOMEDICINE GROUP

Group Leader: Professor Maria Kavallaris
Senior Scientist: Dr Anna Guller
Senior Research Officer: Dr Ernest Moles Meler

Project 24

Project Title: **Engineering childhood cancer models for precision medicine**
Supervisor: Prof Maria Kavallaris mkavallaris@ccia.org.au
Dr Anna Guller aguller@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:

Neuroblastoma and sarcoma patients with recurrent and drug resistant disease have less than a 30% chance of survival and limited therapeutic options. Preclinical models hold a great promise in improving personalised medicine approaches and as a result - patient outcomes. Our laboratory is using 3D bioprinting technology to create culturing conditions for patient-derived cancer cells that mimic native tumour microenvironments.

The extracellular matrix (ECM) is an important component of the tumour microenvironment. However, its roles in childhood solid tumours are not well characterised. Initial gene expression analysis indicates that specific ECM genes are abundantly expressed in these tumours. This project aims to investigate the ECM proteins in patient tissue samples as well as to understand the connection between protein expression and patient survival. The impact of these ECM proteins on the tumour growth will be evaluated by establishing and investigating mini-tumours in a dish using advanced 3D bioprinting technology. This exciting project will contribute to developing predictive preclinical models of childhood cancers and improve therapy for high-risk paediatric cancer patients.

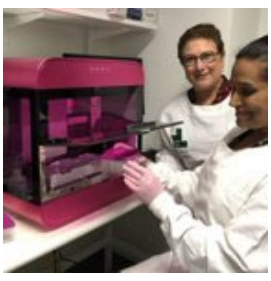
Project 25

Project Title: **Investigating immune cell reprogramming mRNA nanotherapeutics in immunocompetent models of paediatric brain and neuronal cancers**
Supervisor: Dr Ernest Moles emoles@ccia.org.au
Prof Maria Kavallaris mkavallaris@ccia.org.au
Dr Maria Tsoli mtsoli@ccia.org.au
Suitable for: Honours, Masters or PhD Students
Project outline:

Cancers originating in the brain and peripheral nerves, such as diffuse midline gliomas and high-risk neuroblastoma, are among the most aggressive cancers during childhood. Chemotherapy and radiotherapy have been vastly unsuccessful, and there is an urgent need to develop safer and more potent treatment strategies for these cancers.

Herein, the student will participate in an innovative and multidisciplinary project whereby we aim to redirect the immune response in the patient, using injectable messenger RNA nanoparticles, to identify and eliminate the cancer cells. Moreover, this treatment approach will be investigated in advanced murine models of brain cancer and high- risk neuroblastoma that harbour an intact functional immune system and closely resemble the behaviour and pathophysiology of human disease.

The student will learn innovative tools and acquire knowledge in cancer biology, cellular therapy, and mRNA nanomedicine to advance the next generation of therapeutics to fight the deadliest of all paediatric cancers.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Project 26

Project Title: **5-ALA-Assisted Low-Dose Radiotherapy for Inoperable Paediatric Brain Tumours**
Supervisor: Dr Anna Guller aguller@ccia.org.au
Prof Maria Kavallaris mkavallaris@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:

In children, many brain cancers, including paediatric high-grade gliomas (pHGG), arise in intracranial regions that cannot be safely operated on. Radiotherapy provides an opportunity to reach the tumour without surgery. However, standard high-dose radiotherapy is often not sufficiently effective, carries high toxicity, and frequently fails due to rapidly developing radioresistance. There is an urgent need to develop safer and more targeted strategies for treating inoperable brain tumours.

This project explores the novel use of unique, safe and clinically approved metabolic agent, 5-aminolevulinic acid (5-ALA). When taken orally, 5-ALA is converted into a fluorescent compound, protoporphyrin IX (PpIX). Tumour cells, due to their altered metabolism, accumulate more PPIX than healthy counterparts. The fluorescence of PPIX under visible light is used in adult neurosurgery to make tumours visible in operational field. However, PPIX also can absorb electromagnetic waves with short wavelengths and act as a localised enhancer of the effect of ionising radiation (radiosensitiser). This opens the possibility to employ lower radiation doses and activate additional mechanisms to suppress cancer cells (e.g., mitochondrial stress and ferroptosis), rather than relying solely on conventional DNA damage. This approach may improve treatment selectivity and reduce harm to healthy tissue in patients with childhood brain cancers. The current project will bridge the key knowledge gaps towards its application in this setting.

The student will create and use original 3D in vitro models of childhood brain cancers that mimic the brain environment. Techniques may include cell culture in vitro, tissue engineering, experimental low-dose radiotherapy, microscopy, spectroscopy, biomaterials analysis, gene expression profiling and bioinformatics. This multidisciplinary project is adaptable for Honours, Masters, and PhD students, and can be scaled based on experience and timeframe.

Project 27

Project Title: **Non-Invasive Physical Treatments for Paediatric Brain Cancers**
Supervisor: Dr Anna Guller aguller@ccia.org.au
Prof Maria Kavallaris mkavallaris@ccia.org.au
Suitable for: Honours, ILP or PhD Students
Project outline:

Childhood brain tumours such as high-grade gliomas (pHGG) are among the most aggressive and least curable cancers. Surgery is often impossible due to the tumour's location in deep or highly sensitive brain areas. Pharmacological treatments and high-dose radiotherapy are not efficient enough, highly toxic and lead to severe complications. There is an urgent need for more efficient and safer treatment for childhood brain cancers.

This project aims to meet this challenge in a highly innovative way. It explores the therapeutic potential of non-invasive physical factors, such as low-dose or fractionated radiation, focused ultrasound, and complex magnetic fields in pHGG. These factors are pain-free, tissue-penetrating, focusable, and, importantly, unfamiliar to the tumour, giving a chance to improve treatment outcomes by modulating the tumour environment, enhancing the effects of current therapies, and helping to overcome resistance mechanisms.

The student will create and use original 3D in vitro models of pHGG that mimic the brain tumour environment. Techniques may include cell culture in vitro, tissue engineering, microscopy, spectroscopy, biomaterials analysis, gene expression profiling and bioinformatics. This multidisciplinary project is adaptable for Honours, Masters, and PhD students, and can be scaled based on experience and timeframe.

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CANCER TARGETS AND THERAPEUTICS GROUP

Research Fellow: Dr Angelica Merlot

Project 28

Project Title: **Specific Targeting of Tumour-Promoting Cancer-Associated Fibroblasts in Pancreatic Cancer**
Supervisor: Dr Angelica Merlot AMerlot@ccia.org.au
Prof Minoti Apte m.apte@unsw.edu.au
Suitable for: Honours, Masters or PhD Students
Project outline:

Importance of the project:

- Pancreatic cancer remains a death sentence with only 10.7% of patients living 5 years after diagnosis
- Cancer Associated Fibroblasts contribute to disease progression, chemoresistance and metastasis
- Cancer Associated Fibroblasts can be either *tumour promoting* or *tumour inhibiting*
- This project aims to develop novel therapeutics that target tumour promoting Cancer Associated Fibroblasts, while sparing tumour inhibiting Cancer Associated Fibroblasts to improve patient outcomes.

What the project will involve:

- This study will use cell culture (a range of cells lines, including patient derived pancreatic cancer cells), fresh patient tissue, molecular biology techniques, fluorescent/confocal microscopy, mouse models, patient samples, *etc*.
- Feel free to contact Dr. Angelica Merlot to have a chat about whether the project matches your interests.

Project 29

Project Title: **Examining the Surfaceome of Brain Cancer Cells to develop novel therapeutics**
Supervisor: Dr Angelica Merlot AMerlot@ccia.org.au
A/Prof Tushar Kumeria t.kumeria@unsw.edu.au
Suitable for: Honours, Masters or PhD Students
Project outline:

Importance of the project:

- Brain Cancer Kills more children than any other disease.
- New therapeutics are difficult to develop due to the Blood Brain Barrier.
- Cancer cell surface proteins are attractive targets due to their accessibility and dysregulated expression in cancer.
- In this project, we will uncover the cell surface protein targets on brain cancer cells and develop novel targeted nanoparticle anti-cancer therapeutics.

What the project will involve:

- The project will use a combination of techniques including biotinylating membrane proteins, mass spec, the use of patient tissue, orthotopic mouse models, nanoparticle development, molecular biology experiments, microscopy, etc.
- Feel free to contact Dr. Angelica Merlot to have a chat about whether the project matches your interests.

Project 30

Project Title: **Targeting polyamines to eradicate the root of relapse in neuroblastoma**
Supervisor: Dr Angelica Merlot AMerlot@ccia.org.au
Dr Klaartje Somers ksomers@ccia.org.au
Suitable for: Honours, Masters or PhD Students
Project outline:

Importance of the project:

- Relapse is a major cause of cancer related death.
- Cancer Stem Cells can survive cancer therapeutics and restore the tumour to become more aggressive and resistant.
- Targeting polyamines that are upregulated in Cancer Stem Cells could eradicate this population, and therefore the root of relapse in neuroblastoma.

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What the project will involve:

- This Project will determine the molecular mechanism of action of a novel polyamine inhibitor combination to eradicate cancer stem cells and how this compares to drugs currently used in the clinic.
- This will involve the use of patient tissue, western blotting and/or qPCR, cell viability assays and clonogenic assays.

Join Our Team

Cancer cuts life short for hundreds of children in Australia every year, before they've even had a chance to make their mark. You can help change that. Be part of a team that is working tirelessly to find a cure for childhood cancer. A team that is working together every day to help children live longer and more fulfilling lives.

If you're interested in pursuing any of the projects listed above, please get in contact with the relevant research leader or visit the **CCI website** for more information.

Children's Cancer Institute
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NSW 2033

Website: www.ccia.org.au

2025 CCI Students

CHILDREN'S CANCER INSTITUTE

Our values

Own it, do it

We make decisions, take ownership and turn intentions into meaningful actions.

Achieve as one

We embrace an Institute-first mindset by working together to achieve greater impact.

Balance head and heart

We balance objective reasoning and empathy ensuring our actions are well-informed and respectful.

Challenge today, change the future

We challenge what's possible in pursuit of our mission to cure all children of cancer.

Children's Cancer Institute

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