THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Researcher profiles and projects

The University of Queensland Diamantina Institute 2022

The University of Queensland Diamantina Institute (UQDI) is a leading research centre focussing on cancer, immunology and the genetic basis of disease. UQDI is best known for the development by Prof Ian Frazer AC of the Gardasil cervical cancer vaccine that has saved thousands of lives.

UQDI is part of the Faculty of Medicine and is situated in the Translational Research Institute (TRI) at the Princess Alexandra Hospital site in Woolloongabba, which is linked to the St Lucia and Herston UQ campuses by an easy bus ride. TRI provides world-class research facilities for commercialisation and the translation of scientific discoveries to the clinic.

We welcome students who wish to carry out undergraduate, honours or higher degree research projects with our world-leading biomedical researchers. We also offer training opportunities in research translation, business development and commercialisation. Join our thriving student group who will welcome you to our Institute!

Paul Clarke
Director, UQ Diamantina Institute

- Career development
- Collaborative
- Clinical exposure
- Incredible facilities
- Access (human specimans)
- Cutting edge technology
- Mentorship
- Inclusive

Shannon Quah

Honours Student

"UQDI creates a supportive and encouraging environment for students who are interested in research. I am grateful for having access to resources like seminars, workshops, and advanced lab facilities. Opportunities to get involved in translational biomedical research are readily available, not to mention the fancy infrastructure which really impresses me."

Daniel Butcher

Honours Student/causal Research Assistant

"UQDI is a fantastic institute that allows leading scientists to collaborate daily, sharing opportunities, resources and most importantly, ideas. Being surrounded by world-leading experts and exceptional facilities makes it easy to excel and produce ground-breaking research."

Isis Talyor

Honours student

"Undertaking my Honours at UQDI opened many opportunities to connect with like-minded people in both an academic and social setting. I could present my work and learn from others, while gaining what I hope to be life-long friendships as well. "

Diamantina Institute

The University of Queensland Diamantina Institute (UQDI) is a modern research facility where clinical and basic science are used to study cancer, immunolgy and genomic medicine.

The Institute has a vibrant community of over 300 researchers, students and support staff. We have delivered global, world-changing discoveries to humanity, such as the world's first cervical cancer vaccine.

Based at the Translational Research Institute (TRI) beside the Princess Alexandra Hospital, UQDI has strong clinical interactions and world-class facilities that enable researchers to be at the forefront of their fields. UQDI's position within the TRI allows for a much greater collaborative research environment, allowing our researchers to focus their efforts on turning their scientific discoveries into new treatments for diseases including a variety of cancers, arthritis and other autoimmune diseases.

UQDI focuses on bringing the discoveries of basic science to the patient.

We aim to translate the greatest opportunities for research discoveries into the cause, mechanism, prevention and treatment of major disease.

As part of The University of Queensland's prestigious Faculty of Medicine, UQDI is committed to making a global difference to health outcomes.

For further information visit
di.uq.edu.au

Key research themes:

Cancer

Genomic medicine

Immunity and Inflammation

Immunotherapy

Skin and skin cancer

Undergraduate research projects

UQDI offers various opportunities for undergraduate students to gain research experience in biomedical research facilities including Summer and Winter research projects.

For further information visit *di.uq.edu.au/study/undergraduate*

Summer research projects

For further information visit: *medicine.uq.edu.au/research/research-strategy-and-support-office/summer-research-program*

Winter research projects

For further information visit: *medicine.uq.edu.au/research/research-strategy-and-support-office/winter-research-projects*

In July of each year UQDI offers a one week course in advanced immunology.

For further information visit: *di.uq.edu.au/event/2293/advanced-immunology-course*

Honours program

UQDI hosts honours students enrolled through other schools within the Faculties of Science or Medicine at UQ or affiliated Institutions. These include (but are not limited to) the School of Chemistry and Molecular Biosciences, or the School of Biomedical Sciences at UQ.

The Honours Program is a one year full time course. Students must fulfill the prerequisites of the undergraduate Faculty/School through which they are enrolled.

For further information visit: *di.uq.edu.au/study/honours*

MD student research experience

UQ Medicine is committed to enhancing the research training and experience for students in the Medical Program.

There are a number of ways students can incorporate research training and experience into their medical degree.

For further information visit: *medicine-program.uq.edu.au/research/research-your-medical-degree*

Research higher degree

UQDI is an internationally recognised research facility where clinical and medical sciences converge in the translational research of cancer, disorders of immune regulation and genomic medicine.

For more information on starting a Higher Degree by Research with us, please visit: *medicine.uq.edu.au/future-students#qt-study-foundation-tabs-4*

Professor Gabrielle Belz

Research Field

Transcriptional regulation of immune cell development and memory formation in pathogen defence and mucosal immunity

Research Synopsis

Our work aims to understand how the immune system responds to infections including viruses, bacteria and parasites.

We are investigating how different types of immune cells develop, and what factors influences their decision to become one type of immune cell or another to mediate long term immune protection.

Understanding how the body deals with pathogens will give clues about how to enhance protective immunity. Our goal is to discover new therapies that boost our immune system to protect against infection.

Research Projects

- Identifying novel functions of innate lymphoid cells and NK cells in immune protection
- Unravelling the microbome-epithelial-immune interface protecting mucosal surfaces
- Elucidating the mechanisms responsible for the generation of protective immunity in response to lung and gastrointestinal pathogens

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Professor Antje Blumenthal

Research Field

Innate immunity and infectious diseases

Research Synopsis

With resistance to antibiotics on the rise, new insights into host defence mechanisms that control pathogenic bacteria are vital for the development of novel therapeutic interventions. Our research focuses on molecular pathways that are important for the recognition and control of bacterial pathogens as well as those that orchestrate inflammatory responses during infection.

Students are part of a dynamic research team to maximise their research training and experience. The research employs a series of molecular, cell biological and immunological techniques to define novel molecular and cellular aspects of the host response to infection.

Research Projects

- Innate immune recognition of pathogenic bacteria
- Molecular regulation of host anti-microbial defence mechanisms

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Dr Andrew Brooks

Research Field

Class I cytokine receptor signalling and HLA-G regulation of inflammation

Research Synopsis

Our research focuses on understanding the mechanisms of cytokine receptor signalling and how these receptors regulate cell behavior and functions such as inflammation, blood cell formation, postnatal growth, obesity, and lactation. Dysregulated cytokine receptor signalling leads to many diseases such as cancer and inflammatory diseases such as liver fibrosis, inflammatory bowel disease, and arthritis. The development of novel molecules that target cytokine receptors or their signalling pathways may lead to important therapeutics for a wide variety of clinically important diseases.

Research Projects

- Understanding dysregulated cytokine receptor signalling in leukaemia
- Defining the mechanisms of cytokine receptor signalling
- Developing novel therapeutic peptides targeting cytokine receptors
- Defining the mechanism of HLA-G inhibition of NK cell activation

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Professor Paul Clarke

Research Field

Cell cycle control in cancer

Research Synopsis

Paul Clarke is working on the role of cell division in the development of cancer and in the response of cancer cells to cancer therapies. His research group investigates the role of tumour suppressors and oncogenes that control mitosis and mitotic cell death. His group study the function of proteins in tumour cells using biochemical techniques to identify their post-translational modifications (phosphorylation, ubiquitylation) and advanced microscopy to analyse their localisation and stability in live cells. The group aim to understand why tumour cells often have abnormal numbers of chromosomes and why they become resistant to cell death. This work will improve our understanding of how cancer develops and will provide new strategies for cancer therapy.

Research Projects

- The role of tumour suppressors in mitosis
- Control of mitotic cell death
- The relationship between cellular ageing and cancer

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Dr Jazmina Gonzalez Cruz

Research Field

Cancer immunology

Research Synopsis

Immunotherapies herald a new era for management and treatment of solid tumours. Immune checkpoint inhibitors (ICI) are now in use to treat radio-resistant and recurrent Oropharyngeal Squamous cell Carcinomas (OPSCC). Unfortunately, only 20% of these patients benefit from ICI therapy. My research group aims to answer 3 questions: why 80% of OPSCC patients failed ICI therapy? Which factors define and contribute to the success of 20% of those patients? And can we use these findings to stratify and select better treatments for OPSCC patients? To do so, my group is profiling the blood and tumours of OPSCC patients with high-throughput technologies, such as 10X Genomics Spatial Visium, Nanostring DSP GeoMX, CODEX and multiparametric flow cytometry. The correlation of each patient's disease profile with their clinical history will help us to predict the likelihood of future patients to respond to treatment and will assist in the selection of tailored approaches based on each patient's own disease characteristics.

Research Projects

- High-resolution mapping of head and neck cancers to define the cancer/immune system interface.
- Generation of a preclinical humanized skin graft model to expedite novel cervical cancer therapies.
- A phase 2 study of de-escalation in cutaneous squamous cell carcinoma with the use of neoadjuvant Pembrolizumab
- Enhancing tumour immune detection by targeting replication stress.
- Characterization of peripheral CD4+CD8+ T cells.
- Local use of Immunotherapies to treat cutaneous squamous cell carcinoma in organ transplant patients.

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Professor Ian Frazer

Research Field

Tumour immunology

Research Synopsis

As immunologists, we work on the skin immune system and how the immune responses at squamous epithelial surfaces are influenced by epithelial proliferative disease and by the skin microbiome.

We work with animal models of human squamous skin cancer, and with patients with human squamous skin cancers, as part of a consortium including experts in microbiology, ecogenomics, genomics, proteomics and clinical management.

Research Projects

- Effects of epithelial proliferation on local immune effector function in skin
- Bacterial colonisation as a driver of epithelial proliferation and inflammation
- Influence of viral infection on local immune responses and epithelial proliferation

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Dr Fernando S. F. Guimaraes

Research Field

NK cell biology and immunotherapy

Research Synopsis

Natural killer (NK) cells can recognise and respond to tumour cells through a broad range of inhibitory and activating receptors. The regulation of these responses emerges from the integrated balance of activating and inhibitory signals at the NK cell-tumour interface, which help NK-cells discriminate between altered target cells (cancer or pathogen-infected cells) and healthy cells. However, both cancer cells and pathogens can still evade NK cells' detection and killing action. My research focus is to develop effective therapies that maximise NK cell responses—an emerging field with great potential for applications in the clinical management of disseminated cancer and sepsis prevention. For example, my work has uncovered that members of the Transforming Growth Factor (TGF) beta superfamily are potent inhibitory checkpoints of NK cells function. Their presence within the tumour microenvironment and infection sites can lead to tumour immunity and sepsis, respectively. This knowledge is opening a new paradigm for developing cancer and infection immunotherapy approaches. My vision is to build from this discovery and other advances in the field to generate a novel pipeline of cell immunotherapies both "targeting" NK-cells and "based on" NK-cells to increase NK-cells function against cancer (e.g., anti-metastatic function) and sepsis.

Research Projects

- Developing and tailoring NK cell-based cancer immunotherapies
- Deciphering regulatory signalling pathways in NK cells
- Elucidating the role of NK cells in inflammatory disorders

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Professor Nikolas Haass

Research Field

Melanoma cell biology and experimental melanoma therapy

Research Synopsis

Using cutting-edge technology, including real-time cell cycle and cell death imaging in several three-dimensional cell culture and in vivo models, we investigate the biology of tumour heterogeneity as well as the immune environment with the goal to develop novel therapeutic approaches by overcoming drug resistance.

Research Projects

- Targeting melanoma plasticity to improve both targeted and immune therapy
- Targeting melanoma invasion and metastasis to improve both targeted and immune therapy
- Overcoming Immune Checkpoint Inhibitor Resistance to Improve Melanoma Therapy
- Defining molecular signatures that orchestrate tumour subpopulations in melanoma models mimicking tumour microenvironment and drug tolerance
- Mathematical modelling of 4D multicellular melanoma spheroids (joint project with Professor Matthew Simpson, QUT)

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Associate Prof Emma Hamilton-Williams

Research Field

Immunology and pathogenesis of type 1 diabetes

Research Synopsis

We focus on understanding how immune tolerance is disrupted leading to the development of type 1 diabetes (T1D). Current projects include:

(i) The gut microbiota as a trigger and therapeutic target for preventing T1D

Using state-of-the-art 'omics technologies to probe disturbances in the gut microbiota prior to T1D onset in children. Clinical trials of microbiome-targeting prebiotic supplements aimed at preventing T1D. Using novel human-microbiota associated mouse models to model gut microbiota features required to prevent T1D.

(ii) Developing an immunotherapy for T1D

We use nanoparticle technology to deliver an immunotherapy that specifically tolerises the immune cells that cause T1D. We are using humanised animal models and CRISPR/Cas9 gene editing to study the impact of this therapy on the T-cell populations that cause disease.

Research Projects

- Gut-microbiome targeted dietary supplements as a potential therapy for T1D
- Early-life factors and the gut microbiota as drivers of islet autoimmunity and T1D
- Antigen-specific immunotherapy for induction of T-cell tolerance in T1D

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Dr Colm Keane

Research Field

Immune Responses in B cell lymphoma

Research Synopsis

The Keane Lab is focused on the interface between the tumour microenvironment and the malignant lymphoma cell, with a goal to build an understanding of lymphoma from an immunological and biomarkers perspective. To bridge developments between the clinic and bench-top, the laboratory has a strong emphasis on patient material, which it obtains from international and national clinical collaborators, much being from investigator-led clinical trials. Lymphomas studied include more common lymphomas such as Hodgkin Lymphoma, Diffuse Large B-cell Lymphoma and Follicular Lymphoma but the lab has a particular focus on rare lymphomas such as primary central nervous system lymphoma and lymphomas that develop in patients who are immunocompromised.

The goals of the lab are to directly improve outcomes for all lymphoma patients by performing innovative translational science that not only generates new knowledge and brings new treatments to Australian patients but helps to train the next generation of lymphoma researchers in Australia.

Research Projects

- Immune responses in Primary Central Nervous System Lymphoma
- Assessment of immune changes following treatment with immune checkpoint therapy in clinical trials
- Spatial transcriptomics to understand immune response in lymphoma

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Professor Kiarash Khosrotehrani

Research Field

Skin cancer

Research Synopsis

Skin cancers represent the most common human malignancy. Through a common etiopathology, eg sun exposure, cancers of the skin such as melanoma, basal or squamous cell carcinoma are formed from mutant clones of skin cells and may progress to metastasis.

Our lab's efforts focus on limiting the progression of sun-damaged skin towards keratinocyte cancers such as basal and squamous cell carcinoma. However once these cancers or melanomas are formed, our lab tries to understand the molecular events leading to their dissemination through blood vessels.

Research Projects

- To understand the role of endothelial to mesenchymal transition in tumour progression and dissemination using single and spatial Omics
- To understand the changes in photodamaged skin environment leading to skin cancer formation
- To compare tumours from patients who have died from melanoma versus those who have survived using spatial transcriptomics

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Dr Arutha Kulasinghe

Research Field

Immuno-oncology, spatial biology

Research Synopsis

Immunotherapies have led to long-term benefit across a number of solid cancers including lung, skin, and head and neck cancer. However, only a subset of patients appears to benefit from this therapy. Our lab uses cutting edge spatial biology and cellular mapping tools to identify tissue-based signatures of response to therapy.

Research Projects

- To develop biomarkers associated with response and resistance to immunotherapy in head and neck cancer
- To develop a multiomic cellular atlas of immunotherapy resistance/response in head and neck cancer

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Dr Snehlata Kumari

Research Field

Immunomodulatory signalling mechanisms regulating inflammation

Research Synopsis

Our work is focused on elucidating immuno-modulatory signalling mechanisms regulating inflammation to develop new therapeutic strategies for inflammatory skin diseases and cancer. The skin forms immunological, mechanical and structural barrier to protect the organisms from external challenges. Active communication between soluble factors and cells in the skin, such as epithelia, stromal and immune cells are crucial to maintain skin homeostasis. We have previously shown that NF-kappaB, cytokine and cell death signalling pathways are crucial in regulating inflammation. We aim to deciphering novel signalling pathways and mechanisms in immune and non-immune cells in regulating skin inflammation and cancer. The project provides excellent exciting opportunity to students to learn and engage in techniques in Immunology, Molecular Biology, Cell Biology and Genetics including microscopy, CRISPR/Cas9-mediated genetic engineering, flow cytometry as well as in vitro and in vivo models.

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Dr Aideen McInerney-Leo

Research Field

Translating genomics into clinical practice

Research Synopsis

I am a clinician-academic whose interactions with patients have shaped my research questions and fuelled my enthusiasm for the importance of clinical research. I trained as a genetic counsellor and my research now focuses on the integration of genomics into clinical care. My research program has had three primary themes: evaluating the psychosocial impact of genetic conditions and/or genetic testing; evaluating genetics education preferences for patients and healthcare providers; and using next-generation sequencing to increase diagnostic yield for rare disorders.

Research Projects

- Exploring whether genetic fatalism affects sun-related health behaviours in high-risk individuals following genetic testing
- Evaluating the efficacy of videos to promote informed consent for genetic testing
- Mainstreaming Genetic Testing for Melanoma into Dermatology Practice.

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Professor Mark Morrison

Research Field

Microbial biology and metagenomics

Research Synopsis

The microbiome is a new frontier in biomedical research. It is the fusion of the traditional fields of medical microbiology (pathogenesis and epidemiology) with environmental microbiology and ecology (the study of microbial diversity and function in their natural environment).

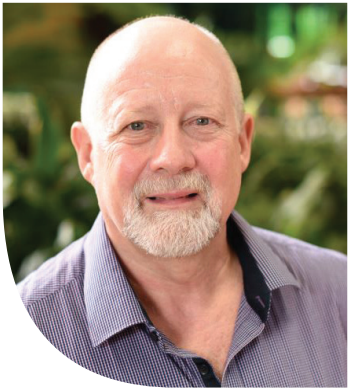
We are investigating and defining the roles of the microbiome in unique clinical studies of Asian and Australian cohorts to advance a pathophysiology-based classification of gastrointestinal diseases, such as Crohn's disease.

To do this, we use innovations in microbial genomics and metagenomics to better characterise the metabolic and bioactive landscape of the gut microbiome during health and disease; and how diet modulates the ecological drivers of the microbiome.

Our overarching objective is to better treat and prevent these diseases by thwarting the underlying mechanisms, rather than controlling symptoms.

Research Projects

- Not all methane is created equally: the role of methanogens and the consequences of a diet-induced inflammatory microbiota
- Epithelial metabolism as a mediator of host-microbiome interactions in inflammatory bowel disease
- The Eastern IBD Gut Microbiota (ENIGMA) project – a comparative study of diet x microbiome interactions in the East and West as drivers of Crohn's disease incidence
- The bioactive landscape of the skin microbiota



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Associate Professor Fiona Simpson

Research Field

Cancer immunotherapy

Research Synopsis

The laboratory is developing adjuvant / combination therapy to improve efficacy of treatment for monoclonal antibody therapy and to decrease innate and acquired resistance. Consequently the laboratory also has cell biological projects on immune cell trafficking, proteins involved in biogenesis of the immunological synapse and monitoring of immune responses during therapy and tumour regression.

Research Projects

- Combination therapies to improve monoclonal antibody therapy outcomes
- Cell biological mechanisms of biogenesis of the immune synapse

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Dr Chris Slape

Research Field

Leukaemia; pre-leukaemia, stem cells

Research Synopsis

Pre-leukaemia is any abnormal haematopoietic state which precedes leukaemia. In some cases (eg. myelodysplastic syndrome), it is clinically apparent. In other cases (eg. T cell leukaemia), patients do not present until acute leukaemia is apparent, and the pre-leukaemic phase can be considered a missed opportunity for therapy.

One of the features of many pre-leukaemic states is, paradoxically, a deficiency of cell numbers in certain stem cell and progenitor cell populations. In our models, we have found that restoration of these cell numbers, by various manipulations, mitigates or abolishes progression to full leukaemia. Our current aims are centred on understanding the mechanisms by which this occurs, and identifying ways to exploit this finding for therapeutic implementation.

We use in vivo and in vitro models, multi-colour flow cytometry, single cell RNA sequencing and imaging technologies to drive our research. All projects have flexible scope and can accommodate the diverse interests of students.

Research Projects

- T cell pre-leukaemia detection in archived human samples
- Cell competition as a tumour suppression mechanism
- Therapeutic progenitor restoration in pre-leukemic mice

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Professor H. Peter Soyer

Research Field

Early detection of melanoma

Research Synopsis

Professor Soyer is an internationally renowned academic dermatologist with over 30 years experience in the field with special expertise in preventative dermatooncology, dermatopathology and dermatologic imaging. His main research focus is skin cancer (both melanoma and keratinocyte skin cancer), with a particular interest in early detection strategies and expanding the concept and applications of teledermatology and teledermoscopy. He is Chief Investigator of the CRE for the Study of Naevi was awarded an NHMRC Partnership Grant to implement an innovative 3D teledermatology network for the early detection of melanoma in high risk individuals. He was awarded a MRFF Practitioner Fellowship, Next Generation Clinical Researchers Program. Most recently he obtained funding from the Australian Cancer Research Foundation (ACRF) to establish the Australian Centre of Excellence in Melanoma Imaging & Diagnosis (ACEMID). ACRF ACEMID will enable establishment of 15 3D total body imaging systems, linked by a telemedicine network, across Australia's east coast, and facilitate research in the early detection of melanoma.

Research Projects

- Australian Cancer Research Foundation (ACRF) Australian Centre of Excellence in Melanoma Imaging and Diagnosis (ACEMID)
- NHMRC Collaborative European Union grant: Intelligent total body scanner for early detection of melanoma
- Automated Objective deep phenotype for melanoma risk factors from 3D total body imaging
- Validation of AI software for lesion diagnosis and change detection

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Dr Mitchell Stark

Research Field

Melanoma/skin cancer genomics and biomarker discovery

Research Synopsis

My research group is based within the Dermatology Research Centre at UQDI and our overall theme is to identifying biomarkers for the early detection of melanoma and skin cancers. By preventing melanoma/skin cancer formation in its earliest stages, we can effectively put the brakes on and halt the formation of metastatic disease. At the other end of the spectrum, late-stage melanoma patients are currently being treated with effective therapies but unfortunately this doesn't apply to everybody. By investigating the clinical utility of predictive and prognostic 'liquid biopsy' biomarkers, we aim to improve the overall efficacy of current therapies.

Together with our biomarker discovery, we are also currently creating a "pre-cancer" atlas of over-lapping genomic data (exome, RNA-seq, methylation) from skin and naevi to identify novel mechanisms for melanoma development which may provide avenues for potential therapeutic intervention.

Research Projects

- Melanoma and Naevi genomics and transcriptomics
- MicroRNA analysis of the progression of early skin lesions toward SCC
- Predictive and prognostic biomarkers for melanoma brain metastasis
- Functional validation of molecular pathways involved in Seborrhoeic Keratosis development

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Professor Ranjeny Thomas

Research Field

T cells, viruses and the pathogenesis of rheumatoid arthritis

Research Synopsis

Joint inflammation, particularly in the synovial tissue, is a classic manifestation of rheumatoid arthritis (RA). T cells accumulate in the synovial tissue where they interact with antigen-presenting cells and provide help to support B cell-driven autoantibody production. But what drives autoimmune inflammation in RA synovial tissue, which T cells contribute and how? Proinflammatory cytotoxic T cells (CTLs) were unexpectedly found to infiltrate RA synovial tissue in large numbers. We are studying the contribution of virus-specific CTLs to the development of RA. Our resources include sample biobanks, tissues from newly diagnosed RA patients, analysis of antigen-presenting cells and antigen-specific T cells, and innovative animal models. We aim to build novel discovery tools and to design interventions targeting the pathogenetic processes driving RA.

Research Projects

- Viral-specific T cells in newly-diagnosed and treated RA patients
- The role of viral-specific T cells in development of autoimmune inflammatory arthritis in mice

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Professor John Upham

Research Field

Immune dysregulation in asthma and host defence against respiratory viruses

Research Synopsis

Our program of translational research is focussed on the study of immune function and dysfunction in asthma, and host defence against respiratory viruses, especially human rhinoviruses.

We are interested in the mechanisms leading to excessive airway inflammation in asthma, and why people with asthma are unusually susceptible to asthma attacks during respiratory viral infections.

Our aim is to discover new therapeutic targets in severe asthma.

Research Projects

- The function of antigen presenting cells, innate lymphoid cells and NK cells
- The role of polarising cytokines such as IL-33, IL-25 and TSLP in altering host defence against viruses
- How macrolide antibiotics alter immune function
- How dietary fibre and the gut microbiome alter immune function in chronic lung disease

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Professor Brandon Wainwright

Research Field

Developing new therapies for paediatric brain cancer

Research Synopsis

Brain cancer is the most common cause of cancer-related death in children. Since the establishment of core radiotherapy and chemotherapy approaches around 25 years ago overall survival has not improved at all despite many clinical trials. Additionally, for those children who survive they commonly suffer serious long term side effects of the treatment itself. Therefore there is an urgent need for better treatments to improve survival, and to discover approaches to both prevent and treat the side effects of therapy.

The Wainwright laboratory discovered the first gene known to cause brain cancer in children. Since that time we have focused on defining the cells of origin of the disease, the genetic pathways that lead to tumour growth and metastasis and the development and testing of new therapies. Our approaches include cell biology, developmental neurobiology, genetics/genomics/bioinformatics and, increasingly, immunotherapies. We have strong and active clinical linkages locally, nationally and internationally and a number of projects that are either in the clinic, or will be in the next 12 months.

Research Projects

- Manipulating the inflammatory response to reduce the side effects of chemotherapy and radiotherapy
- The discovery of genes which influence the response of medulloblastoma to radiotherapy
- Factors which regulate the blood-brain barrier and therapeutic effectiveness in brain cancer
- Attacking cell cycle regulation and the cytoskeleton in medulloblastoma – the molecular basis of the response and drug resistance
- A liquid biopsy approach to monitoring molecular basis of therapeutic response and relapse in brain tumour patients

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Associate Professor James Wells

Research Field

Tumour immunology

Research Synopsis

Our group has 2 major areas of focus.

(1) Immune system recognition and destruction of squamous skin cancers.

We are investigating the mechanisms through which immune cells destroy tumours. Our goal is to determine how immune cells destroy tumours using animal models, so that we can correlate this information to patients in order to highlight appropriate points and strategies for immunotherapy.

(2) Tumor behavior that permits squamous skin cancers to evade host immunity.

Using genetically-linked regressor and progressor tumours, we are seeking to understand how a tumour modifies the immune system in order to become established. Our goal is to understand the key early immunological events that allow tumours to evade the immune system.

Research Projects

- Assessing mechanisms of immune-control for their role in mediating tumor regression
- Defining how tumours harness the immune system in order to establish themselves

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Dr Timothy Wells

Research Field

Host-pathogen interactions in chronic bacterial infections

Research Synopsis

Our laboratory focuses on the interactions between bacterial pathogens and the host immune response during bacterial infections with a focus on the lung.

Although antibody usually protects against infection, our laboratory has identified a specific type of 'cloaking antibody' that actually protects colonising bacteria from immune killing.

Patients with cloaking antibody were found to have worse lung function.

We aim to understand both the bacterial causes and the induction of the immunological response that leads to inhibition of bacterial killing.

We also have a keen interest in studying antibody-dependent enhancement in various bacterial infections by using a mixture of molecular microbiology, immunology and genomic approaches.

Research Projects

- Antibody-mediated enhancement of inflammation
- Impact of cloaking antibodies in chronic wounds

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Professor Di Yu

Research Field

T-cell Immunology and Immunotherapy

Research Synopsis

In the lab of Systems and Translational Immunology Laboratory (STIL), Professor Di Yu and his team are investigating the molecular mechanisms and the landscape by which T cells control the competence and balance of the immune system, intending to design new strategies to modulate the immune system and to treat autoimmune and allergic diseases, infection and cancer. Our research ranges from those at the molecular level to animal disease models and human clinical trials, with the integration of the data-driven systems immunology approach.

Research Projects

- Protective and pathogenic function of cytotoxic T cells in infection and cancer
- The regulation of T cell-B cell interaction in vaccination and autoimmune diseases
- Cytokine-based immunotherapy
- Artificial intelligence-driven "systems immunology" approaches to under the immune system and immune responses

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