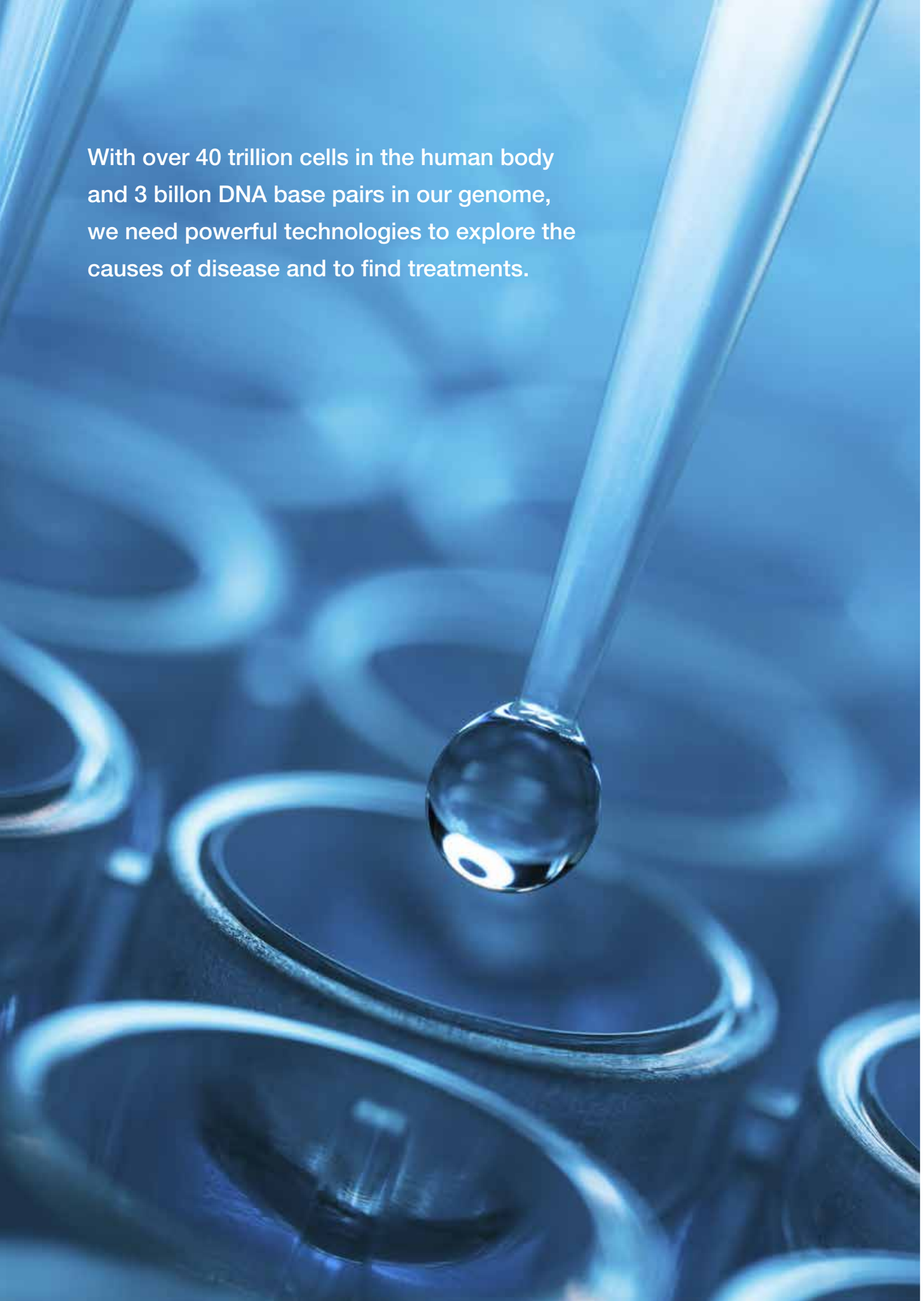
Technology Platforms

Technologies enabling translational research

MHTP Monash Health Translation Precinct | MONASH University | HUDSON INSTITUTE OF MEDICAL RESEARCH | MonashHealth



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Translational Research Facility

About the Monash Health Translation Precinct

Monash Health Translation Precinct (MHTP) partners, Monash University, Hudson Institute of Medical Research and Monash Health are united in their vision to be world leaders in translational research delivering world-leading healthcare.

Located in Clayton in Melbourne's southeast within the hub of the Monash Healthcare Network who service over 40% of Melbourne's population, our scientists, clinicians and academics translate innovative scientific discoveries and revolutionise clinical care in a dynamic and collaborative environment.

MHTP has created a unique environment that consolidates links between education and training, clinical research, and patient care. Integrated research and clinical trials capabilities and access to cutting edge technologies support the vibrant research undertaken with our local, national and international partners and collaborators. We are also ideally positioned alongside the Australian Synchrotron, CSIRO's largest Research and Development site and the Melbourne Centre for Nanofabrication.

MONASH University

Monash University

Australia's largest university

With campuses and partnerships in Australia and overseas, Monash University is ranked in the top one percent of world universities.

Based at Monash Medical Centre, the School of Clinical Sciences at Monash Health (SCS) is a vibrant interdisciplinary hub of teaching and research. SCS has the largest number of PhD enrolments of any clinical school at Monash and is the University home of Hudson Institute and Monash Health researchers.

SCS hosts a comprehensive laboratory based research program integrated with clinical research activities across multiple disciplines focused on translational research. Other Monash University Schools represented at MHTP include the Schools of Public Health and Preventive Medicine, Nursing, and Primary Health Care.

www.monash.edu/medicine/scs

HUDSON INSTITUTE OF MEDICAL RESEARCH

Hudson Institute

Delivering better health through medical research

A leading Australian biomedical research institute, Hudson Institute of Medical Research is recognised internationally for delivering better health through medical research across cancer, inflammation, reproduction and baby health.

Hudson Institute is home to 450 scientists and students who push the boundaries of scientific knowledge through research into complex questions around human disease. New discoveries are translated into improved diagnostics and treatments that provide a better future for all members of our community.

Co-location alongside partners, Monash Health and Monash University, unites and inspires scientists and clinicians in a culture of collaboration and innovation. Our state-of-the-art technologies and expertise in areas such as precision medicine and stem cell therapies allows the rapid acceleration of research discoveries into the clinic.

www.hudson.org.au

MonashHealth

Monash Health

Victoria's largest health network

Monash Health provides award-winning healthcare across the entire lifespan for more than one third of Melbourne's population – from pre-birth, newborn babies and children, the aged, their families and carers. Monash Health's specialties include paediatrics, cardiology, women's health, kidney and pancreas transplants and intensive care for sick and preterm babies in the first few weeks and months of life.

On average each year, Monash Health provides 3.6 million episodes of care to people in our community and our three emergency departments treat more than 220,000 patients.

www.monashhealth.org/

MHTP Technology Platforms

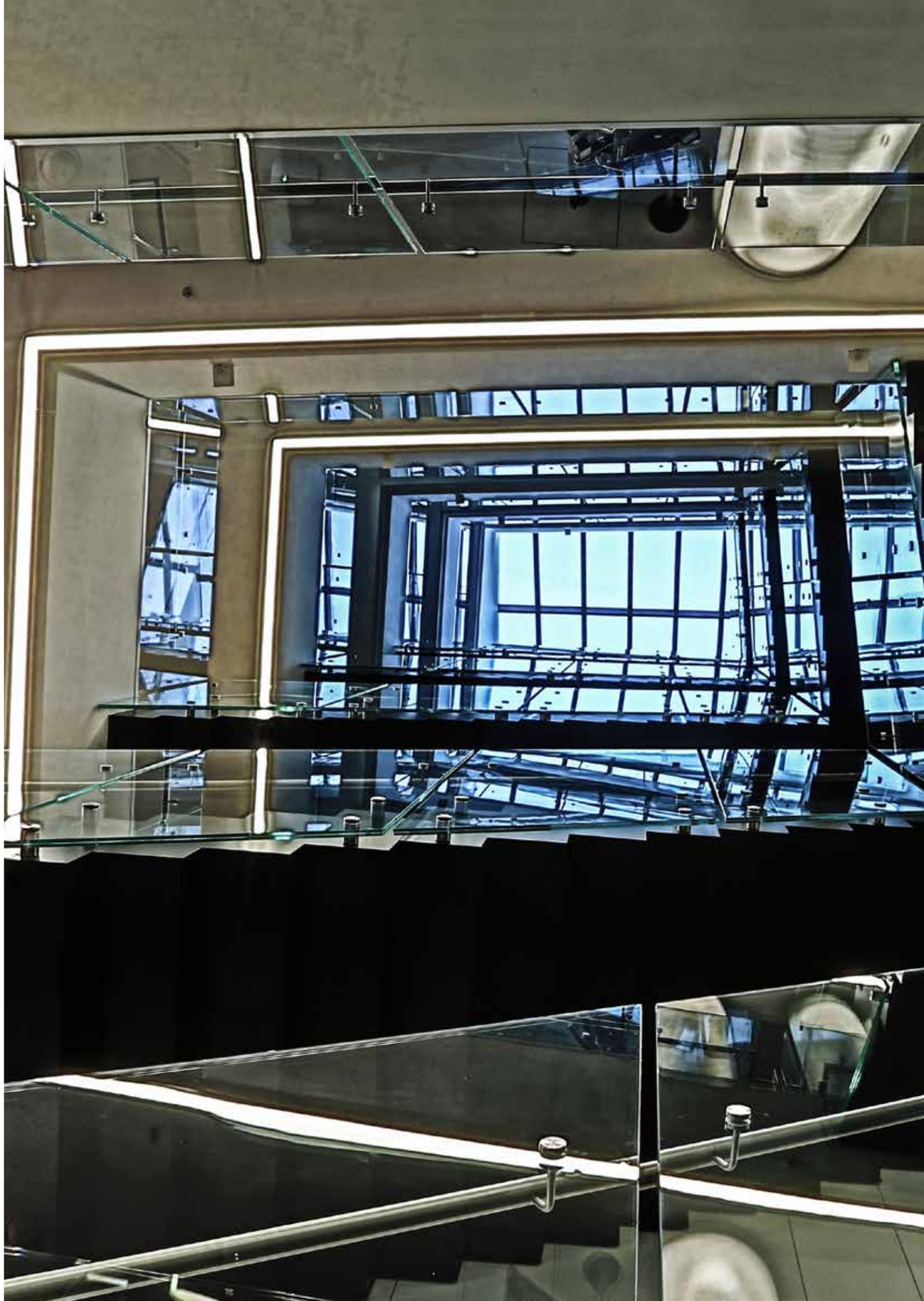
Our pursuit of excellence is underpinned by world-leading capabilities and expertise through our integrated network of MHTP Technology Platforms.

Our network of nine platforms are co-located on a central floor within our new six-storey Translational Research Facility providing seamless interaction between our research activities through to clinical trials. Access is available via a fee-for-service model throughout the MHTP as well as to national and international scientific communities.

Our technology capabilities operate within a unified strategy, governance and quality framework and adhere to international ISO accreditation or certification standards promoting shared research and clinical utilisation.

We encourage you to learn more at www.mhtp.org.au

MHTP Platform Strategic Initiatives Manager: Ms Vivien Vasic



Medical Genomics

The MHTP Medical Genomics Facility provides a comprehensive range of technologies and expertise to analyse DNA and RNA to determine its structure and function and role in health and disease. Our facility is used by numerous organisations and we have important collaborations with Monash Health's Pathology departments and the Monash Technology Research Platforms network.

Technology

We have kept pace with the ever-accelerating rate of genomics and host the latest technologies for discovery research, screening, validation and routine testing:

- 3130xl Genetic Analysers – 16 capillary
- 7900HT Fast Real-Time PCR systems 384-well and TLDA formats
- Qiagility liquid handling systems
- Fluidigm C1™ Single Cell Auto Prep
- Fluidigm BiomarkTM HD system
- Fluidigm MX, HX, RX and Access Array controllers
- Tecan Freedom Evo 100 liquid handling system
- Agilent Bioanalyser
- Agilent TapeStation
- Agilent Microarray Scanner
- Illumina MiSeq, NextSeq 550, HiSeq 1500 and HiSeq 3000 systems
- Covaris Adaptive Focussed acoustics system
- Caliper Zephyr liquid handling robot
- Integrated Twister II plate handling robots
- Dolomite Bio DropSeq System

Expertise

Our dedicated team is committed to provision of professional and comprehensive support. We have all had long standing careers in genomics extending over 20 years.

Services

We provide a broad range of specialist genomic services based upon a fee for service model including:

- Sanger Sequencing (ISO 15189 NATA accredited)
- Quantitative real-time PCR
- Fragment analysis
- Microarray
- Next-Generation Sequencing
- Fluidigm single cell genomics
- Cell line identification
- Drop-Seq Technologies

Contact

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Project examples

Gene Expression signatures in pancreatic cancers

Pancreatic cancer has one of the lowest survival rates of any major cancer and unfortunately these statistics have not changed significantly over the last 40 years. Professor Brendan Jenkins from Hudson Institute's Centre for Innate Immunity & Infectious Diseases and Dr Daniel Croagh, a hepatobiliary surgeon from Monash Health, are involved a clinical trial that is aiming to improve survival rates.

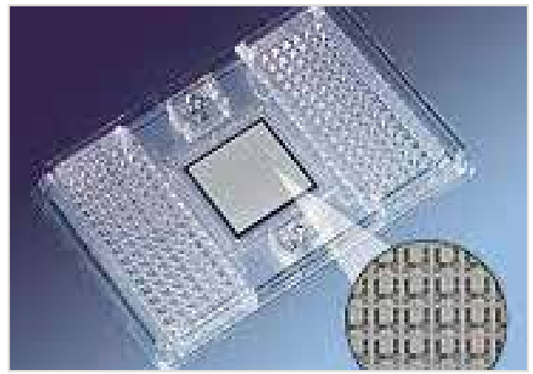
The team are using Next Generation Sequencing technologies to determine the genetic make-up of the patient's tumour and their compatibility with new drugs being trialed. In an approach known worldwide as precision medicine, the information helps to determine how likely an individual will respond to treatment.

Regenerative medicine using single cell transcriptome profiling

Associate Professor Jose Polo and his team from the Australian Regenerative Medical Institute (ARMI) at Monash University have been using our Fluidigm BioMark system to perform single cell transcriptional profiling.

The team are investigating the reprogramming process that occurs when mature cell types transform into induced pluripotent stem cells (iPS cells). iPS cells hold tremendous potential for future personalised cell replacement therapies.

Dr Trevor Wilson operating our Next Generation Sequencing technology



The Fluidigm BioMark 96:96 IFC can simultaneously analyse 9,216 data points per run

Acknowledgments

Through the support of philanthropic organisations, government agencies and our technology partners we are able to advance our major infrastructure and capabilities. We gratefully acknowledge their generous support through the following Centres and Programs:

Gandel Genomics Centre

Gandel Philanthropy have been a dedicated supporter of genomics at the Monash Health Translation Precinct and the Hudson Institute for over a decade through establishment of the Gandel Charitable Trust Sequencing Centre in 2005.

At that time Gandel Philanthropy provided funds to purchase a Genetic Analyser using the latest DNA Sanger sequencing technology. Then following on in 2010 a grant was awarded for a Genetic Microbial Identification System that enabled the rapid diagnosis of bacterial or fungal infections using this technology.

Launch of the Gandel Genomics Centre

In June 2017, we were proud to officially launch the Gandel Genomics Centre as a result of the most recent grant supporting a Gandel Genomics Health Research Program to develop our genomics technologies from basic research through to diagnostics and precision medicine.

The Gandel Genomics Centre will provide the support needed to utilise world-leading technology capabilities and scientific expertise to translate our genomics research enabling more rapid diagnosis, early intervention and prevention, targeted to individual needs.

Funding is perfectly timed in an era in which genomic testing is recognised world-wide as the future direction for clinical diagnosis, replacing current conventional testing.

We are extremely grateful to the Gandel family for recognising the life-changing potential of genomics technologies to transform healthcare and for their dedicated and continuous support.

ACRF Centre for Cancer Genomic Medicine

The ACRF Centre for Cancer Genomic Medicine was established in 2010 through $1.6 million funding from the Australian Cancer Research Foundation (ACRF) which enabled the introduction of Next Generation Sequencing technologies.

Using these state-of-the-art technologies, the Centre supports numerous cancer researchers working on a broad scope of cancer programs towards the prevention, diagnosis and treatment of cancer.

Hudson Monash Paediatric Precision Medicine Program

Recent funding from the Children's Cancer Foundation has enabled purchase of equipment vital for implementation of the Hudson Monash Paediatric Precision Medicine program. Funding also supports utilisation of state-of-the-art genomic capabilities within the MHTP Medical Genomics Facility for tumour sequencing and analysis.

Hudson Monash Paediatric Precision Medicine Program team

The new program, funded through a generous donation of $1,323,000 from the Children's Cancer Foundation, aims to significantly improve treatment for childhood cancer patients diagnosed with brain cancer and solid tumours.

The program, a collaboration between Hudson Institute, Monash Health and Monash University, will focus on brain cancer and solid tumours such as Wilms tumours, with specific emphasis on Diffuse Intrinsic Pontine Glioma (DIPG) during the first two years. DIPG is a devastating childhood brain cancer, with a median survival of only nine months.

This exciting initiative marks a significant investment in future clinical management and novel research discovery in childhood cancer. It will enable scientists at Hudson Institute to establish a living biobank of paediatric brain tumours and solid cancers, including living organoids or lab-grown 'mini-tumours' to trial and develop targeted treatments and improve clinical outcomes, survival rates and quality of life for childhood cancer patients.

It will also establish a functional genomics pipeline; from translation of genomic data into targeted therapies, and facilitate important sharing of information nationally and globally thereby building the expertise, informatic resources and data required to advance precision medicine for paediatric cancer patients.

The Hudson Institute thanks the Children's Cancer Foundation for its generosity, foresight and support.

Fluidigm Single Cell Centre of Excellence

In September 2015, our Single Cell Genomics Centre was awarded Australia's first Single Cell Centre of Excellence by internationally-renowned biotechnology company Fluidigm. Single cell genomics research is emerging as a driving force for discovery in life science, allowing scientists to isolate each individual cell from a diseased organ or tumour to establish which cells are actually causing the disease, or responding to a treatment.

The Centre was established through funding from an Australian Research Council LIEF (Linkage Infrastructure, Equipment and Facilities) grant, through a partnership between Monash University, University of Melbourne, University of Newcastle and Hudson Institute of Medical Research and provides access to these powerful technologies to researchers from all around Australia.

Functional Genomics

Our Functional Genomics Capability provides the tools and expertise for unbiased, high-throughput, gain-of-function and loss-of-function screens in human and mouse cells. Offering both genome-wide or smaller custom-designed screens, the facility delivers a complete gene discovery and characterisation service.

CRISPR-Cas9 is a transformative technology that is revolutionising the fields of genetics, molecular biology and medicine.

Our pooled library screens take advantage of the latest in CRISPR-Cas9 technology (CRISPRc, CRISPRi, CRISPRa) and ORF libraries. Pooled screening is faster, less labour-intensive and more cost-effective than array-based screens, making functional genomics readily accessible for researchers investigating questions ranging from fundamental biology through to addressing clinical need.

Expertise

Our team is dedicated to delivering CRISPR/Cas9 technology across all disciplines. Scientific Director, A/Prof. Sefi Rosenbluh has a wealth of expertise in genomics and pooled library screening and recently joined from Dana Farber Cancer Institute and the Broad Institute of Harvard and Massachusetts Institute of Technology. Dr. Catherine Itman has a broad background in life science and health research and business operations.

Services

We deliver comprehensive project management, based upon fee-for-service model, including:

- Project design and implementation strategy
- Genome wide or custom-designed pooled sgRNA or ORF libraries
- Creation of Cas9/dCas9 cells for CRISPR screens
- Pooled library screening and selection (by antibiotic resistance or fluorescent reporter expression)
- Massively parallel sequencing (next generation sequencing)
- Bioinformatic analysis and data visualization
- Secondary screening, such as single cell transcriptomics (Dolomite Bio single cell RNA-seq)
- Bioinformatic analysis and mechanistic characterisation of hits.

Technology

We offer CRISPRc and CRISPRi for loss-of-function screens and CRISPRa and ORF libraries for gain-of-function screens. Each of these have unique attributes that can be used in isolation or in combination, generating powerful information from gene to phenotype.

- CRISPRc (CRISPR cutting)
  Brunello (human) whole genome library containing 76,441 unique sgRNAs targeting 19,114 genes and microRNAs plus 1000 controls
  Brie (mouse) whole genome library containing 78,637 unique sgRNAs targeting 19,674 genes plus 1000 controls
- CRISPRi (CRISPR interference; human)
  Single library containing 90,000 sgRNAs targeting transcriptional start sites of 17,382 genes plus 1000 controls
- CRISPRa (CRISPR activation; human)
  Two part-libraries which collectively contain 98,000 guide RNAs targeting transcriptional start sites
- ORF (human)
  Single library containing 16,000 human protein-coding sequences. This library contains unique ORF barcoding enabling its use in pooled screening

Custom CRISPR/Cas9 libraries can be designed to meet specific research needs and are unique to each project.

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Flow Cytometry

Flow Cytometry is a high speed laser based technology enabling users to generate multiparametric data about the size and shape of the proteins associated with cells or particles of interest. It is a powerful tool in many fields including immunology, stem cell science and cancer.

The MHTP Node of Monash FlowCore provides researchers access to state of the art instruments and specialist expertise through highly trained and experienced staff. The newly acquired BD ARIA and Fortessa Instruments allow flexibility and capability for deep phenotyping and polychromatic flow cytometry.

Expertise

Operating as a Node of Monash University's world class Flowcore Platform, the MHTP Node is led by Mr Michael Thomson who has extensive experience managing Flow Cytometry facilities and is recognised as a ISAC SRL Emerging Leader.

Services

- Cell sorting, or separation, is provided as a service, where each sort is personally set up and supervised by a dedicated staff member. As a result, researchers can be confident in the pure populations of cells that are isolated for them, which they are able to use in subsequent in vitro or in vivo assays. High level sorting biocontainment is also available
- Users are trained to run their samples on the analysis cytometers and are able to generate large amounts of data in a short time. The cytometers can be fitted with a high-throughput sampler allowing researchers to analyse samples in 96-well plates, further speeding up the analysis process
- We provide training to researchers on the analysis cytometers on a regular basis. We also hold educational seminars and user group meetings which allow researchers from different fields, who are conducting flow cytometry experiments, to come together and learn about developments in the field
- Advice on experimental design and data analysis

Technology

The MHTP FlowCore Node hosts the following instrumentation:

Cell Sorters:

- BD FACSAria Fusion Cell Sorter, equipped with 5 Lasers and 18 Parameter Fluorescence Detection and housed in a Class-II biosafety cabinet, can collect up to 4 unique populations simultaneously, and can additionally isolate single cells for collection
- Beckman Coulter Mo-Flo XDP cell sorter, equipped with 4 lasers and 11 Parameter Fluorescence Detection. Can collect up to 4 unique populations simultaneously; and can additionally isolate single cells for collection

Cell Analysers:

- BD LSR Fortessa X-20, equipped with 5 Lasers and 18 Parameter Fluorescence Detection
- BD FACSCanto II cell analyser, equipped with 3 lasers and 8 Parameter Fluorescence Detection

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Project Example:

Improving patient recovery and immunity after stroke

Stroke is a highly prevalent and debilitating brain injury caused by the sudden impairment of blood flow to the brain. Despite the brain injury, it is beginning to emerge that infections are the leading cause of death in the stroke patients. Currently, there are limited strategies offered to patients focused at managing their infectious complications in the aftermath of stroke.

Neuroinflammation contributes significantly to the pathophysiology of stroke, with the most common medical complication in stroke patients being infection.

Dr Shu Wen Wen from the Neuroinflammation Research Group in the Centre for Inflammatory Diseases (SCS, Monash University) uses flow cytometry to help investigate immune changes that may render the elderly more susceptible to the development of infection after stroke onset.

Findings from this project hope to facilitate the development of clinical care strategies to enhance patient immunity and improve patient recovery after stroke.

BD LSR Fortessa X20

Innate lymphoid cells in maintaining uterine homeostasis

The Regulation of Interferon and Innate Signalling research group within Hudson's Centre for Innate Immunity and Infectious Diseases focus on understanding the molecular regulation of immune responses to infection, inflammation, and cancer. Dr Eveline de Geus within the group uses the flow cytometry facility for sorting rare cell populations of innate lymphoid cells from the uterus using multicolour flow cytometry to characterise their functional phenotype after ex vivo restimulation.

Innate lymphoid cells play an important role in maintenance of mucosal homeostasis and this project will shed more light on the function of these cells in the reproductive tract, their interaction with the microbiome and their role in infectious and inflammatory diseases and cancer.

The group aims to develop new approaches to preventing, diagnosing and treating these diseases.

BD FACS Aria Fusion Cell Sorter

Histology

Histology involves the study of the microscopic anatomy of cells and tissues. Tissues are carefully processed, sectioned and stained revealing delicate morphological features that can indicate health or disease for research, education or clinical studies.

The MHTP Histology Facility operates as a node of the Monash Histology Platform at Monash University.

Through this collaborative model, MHTP researchers have direct access to state-of-the-art instruments including the Aperio slide scanning instruments within the Monash Histology Platform.

The Aperio Scanscope AT Turbo can scan up to 400 brightfield slides at a time while the Aperio Scanscope FL can scan up to 5 fluorescent slides per run. Images are stored on a central server prior to being accessed. Image analysis software is provided free of charge to utilise at your own computer.

Expertise

Ms Camilla Cohen leads an experienced team at the Monash Histology Platform hub in Clayton along with MHTP and Alfred Medical Research and Educational Precinct (AMPREP) Node sites. Camilla draws on over 20 years experience in private and public Histology laboratories and operates both Paraffin and Resin laboratories.

Microscopy

Services

The MHTP Histology node has two service streams: a full end-to-end (Professional) service provided by specialist staff and a self-service (DIY) providing access to specialist laboratory equipment and staining reagents.

The suite of latest equipment introduces the Leica Vibratome VT1200S for sectioning thick sections from live, fresh and fixed tissues, a Dako automated immunostainer and a newly acquired Olympus VS120 scanner for provision of onsite scanning with both bright field and fluorescent capabilities. The Olympus scanner produces the highest quality images and together with an interactive consultation session with the Monash Microimaging Platform, provides a complete image analysis service for researchers.

Contact

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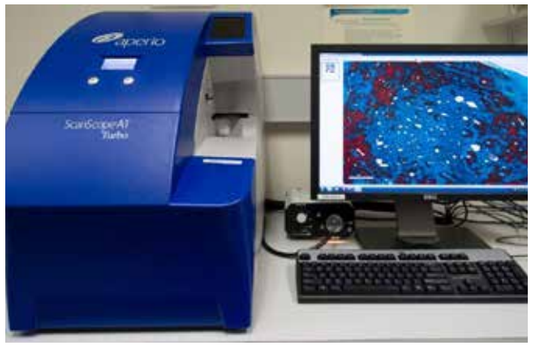
Technology

The paraffin laboratory located at the MHTP is equipped with a broad range of equipment designed to support the most diverse requirements of histology projects including:

- Fully equipped dissection areas and a cassette writer
- Rapid, dual processing Leica ASP300 and Medite TPC 15 Duo tissue processors providing efficient, reliable and timely processing to paraffin wax
- Embedding units for high quality paraffin blocking
- Modern microtomes for specimen sectioning
- Fully equipped staining area
- Cryostats for frozen section generation
- Automated immunostaining unit providing high-through put and consistency for immunohistochemical and immunofluorescent staining
- Vibratome - Leica VT1200S for sectioning thick sections from live, fresh and fixed tissues
- Slide scanner - Olympus VS120 for brightfield and
- Fluorescent scanning

Paraffin laboratory

The resin laboratory is located on the Monash University campus and provides specialised processing, sectioning and staining services for projects requiring resin.



Slide scanning

Tissue processing

Microtomy and Cryotomy

Slide staining

Micro Imaging

The Micro Imaging Facility specialises in optical, fluorescence 4D, live cell and statistical microscopy methodologies, as well as image and data informatics to understand cellular and molecular processes.

The Monash Micro Imaging (MMI) at MHTP Facility operates as a node of Monash University's MMI Platform. The model provides researchers access to additional suites of imaging instruments, training, analysis and expertise located on Monash's Clayton campus and AMREP Node sites.

Under the leadership of Associate Professor Ian Harper, founder and director of MMI, the Facility has grown to become one of the premier imaging centres in Australia.

MMI provides expertise, instrumentation and collaborative research in optical and fluorescence microscopy/confocal microscopy, live cell imaging and image analysis.

Services

MMI charges an annual subscription fee to cover training and instrument access for internal users.

Micro Imaging provides:

- Experimental design and troubleshooting
- Instrumentation
- Training
- Research collaboration
- Project development

Expertise

Manager of the MMI-MHTP node, Dr Kirstin Elgass, has extensive experience in cell and molecular biology, biochemistry, optical physics and mathematics. Optical Microscopy Specialist, Dr Sarah Creed has over 10 years of training and experience in cell biology research and is an expert in fluorescence staining and imaging techniques, 3D, 4D and live cell imaging and imaging of small animal models.

The facility has co-authored over 50 peer-reviewed publications, in journals such as Nature Medicine and Nature Immunology since 2010.

Technology

The MMI-MHTP facility hosts the following equipment

- Olympus FV1200 inverted confocal microscope with live cell environment-controlled incubator
- Nikon C1 inverted confocal microscope with live cell environment-controlled incubator
- Leica SP5 Multiphoton with Spectraphysics MaiTai HP for live animal imaging
- Olympus BX61 Stereology system with fluorescence microscopy and colour camera for histology imaging
- API Deltavision Deconvolution microscope with live cell environment-controlled incubator
- Leica LX6000 inverted fluorescence microscope with live cell environment-controlled incubator
- Perkin Elmer UltraView spinning disk confocal
- Cellomics ArrayScan High Content Screening
- Olympus VS120 Slide Scanner
- Imaris analysis workstations (x3) and Metamorph analysis workstation
- Flash Forge Creator Pro 3D printer
- HTC Vive Virtual Reality with SyGlass Software Additional equipment, accessed through MMI Platform includes:
- Abrio polarisation microscope
- Olympus FV1000 inverted confocal microscope with PicoQuant TCSPC-FLIM
- Zeiss LSM780 NLO with Confocor FCS analysers
- dSTORM (direct stochastic optical reconstruction microscopy) Super-Resolution system
- 3i Lattice LightSheet microscope
- Abberior 3D STED Super-Resolution microscope

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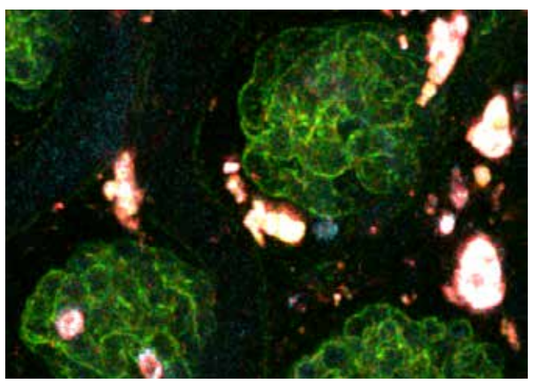
Project examples

Tracking leukocyte cell migration into the kidney and observing their behaviour and relationship with kidney inflammation and damage

Kidney and renal failure involves a multitude of processes, of which the recruitment of leukocytes into the organ and their subsequent inflammatory response plays a major role in tissue damage and injury.

In order to gain more greater insight into the exact cellular and molecular processes involved, A/Prof Michael Hickey's laboratory in the Centre for Inflammatory Diseases of Monash University's School for Clinical Science utilised live animal intra-vital multiphoton microscopy to observe the leukocyte cell migration into the kidney in real time, and tracked their cellular response.

Multiphoton imaging reveals neutrophil retention and intravascular migration in normal and inflamed glomerular capillaries. Sapna Devi, Anqi Li, Camden Lo, Latasha D. Abeynaike, A. Richard Kitching, Michael J. Hickey. Nat Med. 2013 Jan;19(1):107-12. doi: 10.1038/nm.3024. Epub 2012 Dec 16.



Kidney glomerulus, individual filtration units of the kidney

Demonstration of IL-37 cytokine binding to receptors IL-1R8 and IL-18Ralpha as a hetero-dimeric signalling complex on the cell surface

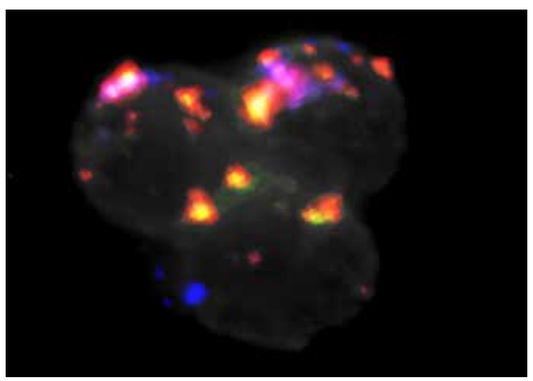
In collaboration with Dr Claudia and A/Prof Marcel Nold's research group from Hudson Institute's Ritchie Centre, the imaging facility adapted the 2014 Chemistry Nobel Prize methodology of super resolution microscopy.

The team demonstrated the binding of a single molecule of IL-37, to its immune cell receptors – IL-1R8 and IL-18Ralpha *in situ* on the surface of human peripheral blood mononuclear cells.

IL-37 is a potent signalling cytokine in humans that can overide the body's existing acute and chronic responses and completely shut down inflammation.

The study showed that the two receptors could form a hetero-dimer in humans, which together act as a cell surface signalling complex for IL-37 to induce its potent anti-inflammatory effect.

IL-37 requires the receptors IL-18Rα and IL-1R8 (SIGIRR) to carry out its multifaceted anti-inflammatory program upon innate signal transduction. Nold-Petry CA, Lo CY, Rudloff I, Elgass KD, Li S, Gantier MP, Lotz-Havla AS, Gersting SW, Cho SX, Lao JC, Ellisdon AM, Rotter B, Azam T, Mangan NE, Rossello FJ, Whisstock JC, Bufler P, Garlanda C, Mantovani A, Dinarello CA, Nold MF. Nat Immunol. 2015 Apr;16(4):354-65. doi: 10.1038/ni.3103. Epub 2015 Mar 2.



Hetero-dimeric signalling complex on the cell surface

Animal Models

Monash Medical Centre Animal Facilities (MMCAF) operates as an integral component of the Monash Animal Research Platform (MARP) dedicated to providing best welfare practices for all animals under our care whilst supporting the various scientific research groups at the MHTP.

Areas within MMCAF include our E Block Specific Pathogen Free (SPF) rodent facility with in-house imaging capabilities, and B Block which houses our conventional animals including large animals such as sheep and the only colony of Spiny Mice in the Southern Hemisphere.

Our mission statement is simple and encompasses what we all aim for in the use of animals in research – "The team at MMC Animal Facilities (MMCAF) is strongly committed to working together in the pursuit of scientific excellence through the supply of high quality care, services and delivery of the best welfare practices for all research animals".

Expertise

MARP is committed to excellence in maintaining the health and welfare of animals under its care and in exceeding the standards specified in the relevant Codes of Practice and industry regulations.

Services

The MMCAF services include:

- Technical expertise, agistment and customised breeding programs for mice
- Access to surgical facilities, imaging and diagnostic equipment and services
- Mouse export services – both locally and internationally
- Agistment, technical and surgical assistance in other species including rats, spiny mice, sheep and rabbits

The MARP services include:

- Rodent reproductive services including embryo re-derivation, cryopreservation and reanimation
- Specialised veterinary services and surgical support
- Supply of animal blood products and antibody production from various animal species
- Rodent import into AQIS accredited facilities

Facilities

Facilities at MHTP include:

- E Block SPF Facility
- B Block Conventional Facility

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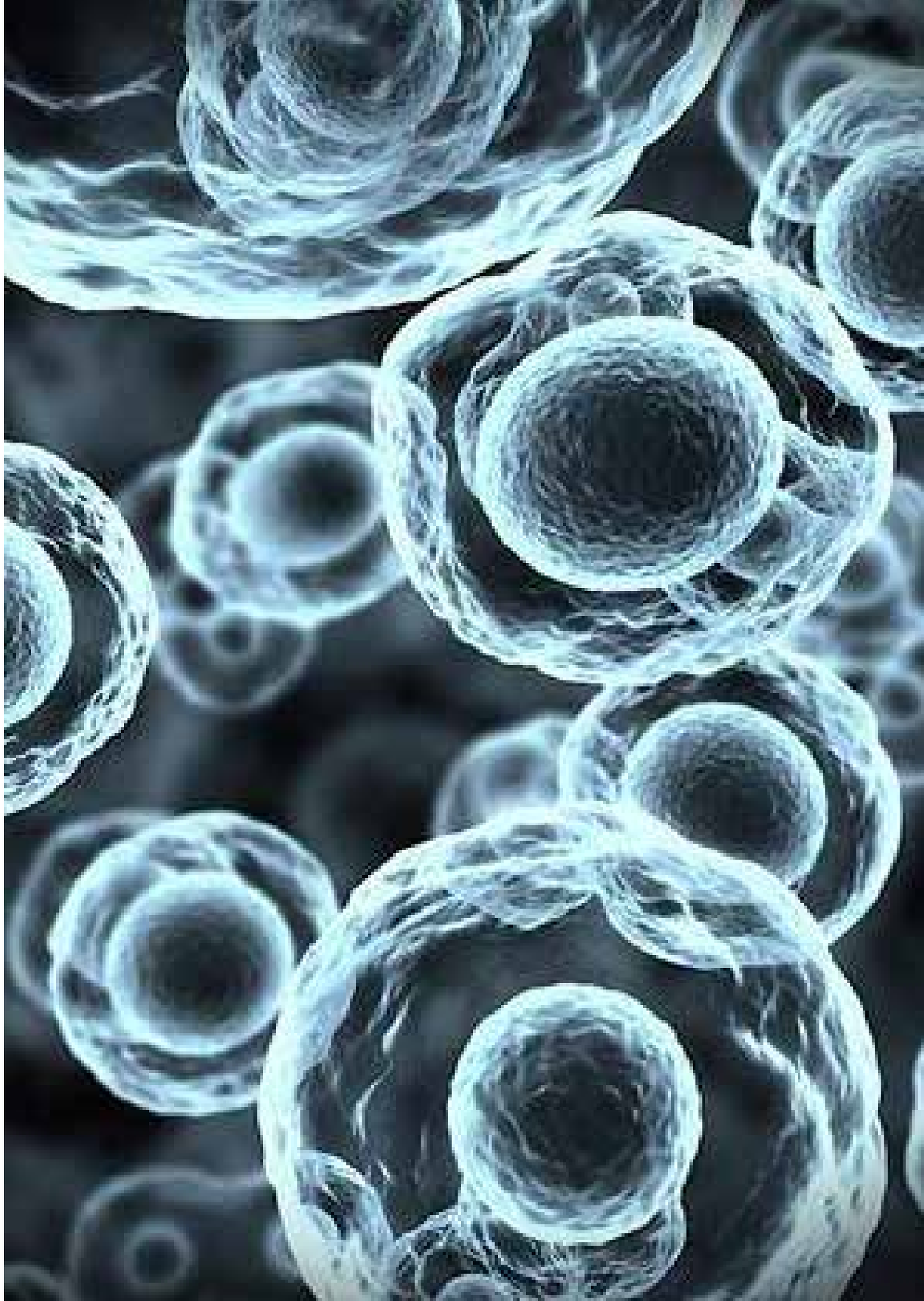

Bioinformatics

Bioinformatics is an interdisciplinary field that develops and improves on methods for storing, retrieving, organising and analysing biological data. A major activity in bioinformatics is to develop software tools to comprehend complex biological systems.

Monash Bioinformatics Platform (MBP) is a core facility that provides bioinformatics support to the University and affiliated organisations in partnership with research groups and facilities.

The Bioinformatics team has a wide range of expertise in biological research fields requiring cutting edge computational techniques such as genomics, proteomics and structural biology.

MBP are also a hub for a distributed network of bioinformaticians embedded across the University and affiliated organisations and a partner in technical training and infrastructure development.

The MHTP operates as a node of the MBP to provide support for the medical genomics clients through the presence of our on-site Senior Bioinformatician. It is strongly encouraged to meet with a bioinformatician prior to project commencement and sample processing to ensure the best experimental design is implemented.

Expertise

The Monash Bioinformatics Platform consists of a group of bioinformaticians with diverse background and skills. Diversity of experience is critical to build the breadth of expertise required in such a varied field as bioinformatics.

Capabilities

- **Differential Gene Expression** – Statistical analysis of differential gene expression from transcriptomics data (microarray, RNAseq)
- **Variant Identification** – Identification of genetic variants (SNPs and InDels) from large scale genomics data
- **Methylation and ChIPseq** – Exploration of epigenetics and post-transcriptional modifications of the genome and its expression
- **De-novo assembly** – In silico assembly of transcriptomics or genomics data from non-model organisms

Infrastructure

The Monash Bioinformatics Platform can provide access to bioinformatics tool servers. These are operated and maintained by the Platform and geared at researchers and research groups who desire to run their own bioinformatics processes without time-consuming installation and setup.

The Platform has close ties to peak technology providers and can help researchers receive access to specialized computational and storage infrastructure, including:

- Research Cloud @ Monash
- VicNode Storage
- Monash Campus Cluster
- MASSIVE

Activities

1. The Monash Bioinformatics Platform team is available to provide bioinformatics advice for research projects, and strongly encourages researchers to meet with them before commencing an experiment. They also collaborate and perform direct analysis for various projects across the MHTP partners.
2. MBP can help researchers access their compute and storage infrastructure, or obtain their own resources geared towards bioinformatics analysis.
3. MBP provides a hub for the bioinformatics community at Monash. From beginners in bioinformatics to experts, we encourage engagement with our team.
4. The team also runs regular hands-on training workshops over a wide range of technical topics, from basic programming to high throughput biological data analysis.

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Cell Therapies

The Cell Therapies and Regenerative Medicine Platform hosts a biological isolator that provides a fully contained and controlled environment suitable for the processing of human cells and tissue. This facility has been established to boost the clinical development of human cell-based therapies and regenerative medicine applications.

The Cell Therapies and Regenerative Medicine Platform (CTRM), incorporating the Victorian Consortium for Cell Therapies (VCCT) Biological Isolator Facility, was established by Monash University in 2012 under the Federal Government's National Collaborative Research Infrastructure Strategy (NCRIS) Project.

With the support of the VCCT, an association of over 20 public and private organisations with a shared vision to foster clinical translation of cell therapies in Australia, the project culminated in the installation and commissioning of a custom-built BioSpherix Xvivo isolator system which is located within the CTRM Platform.

The Platform was awarded the inaugural Miltenyi Biotec Cell Therapy Centre of Excellence in August 2016 and is also proud to be a founding partner of the Monash MedTech (M2) joint venture between CSIRO, Monash University and the MHTP, an initiative that aims to help companies address the translational challenges of the medical device industry.

Full containment reduces contamination risk

Services

The CTRM Platform provides a flexible, cost-effective alternative to traditional cell therapy manufacturing facilities. It is available to researchers within and outside the MHTP seeking to translate their human cell and tissue-based therapies to the clinic.

Technology

The BioSpherix Xvivo isolator provides a sterile, fully contained environment ideally suited for processing of cells for pre-clinical and clinical studies.

The isolator is a fully integrated unit comprising processing chambers, incubators, a centrifuge and a microscope; eliminating the need to perform processes outside the contained environment.

Each chamber within the isolator can be independently controlled, providing the capacity for cells to be maintained at optimal conditions throughout the entire process.

The facility also offers state-of-the art 3D bioprinting technology and cGMP compliant cell sorting capabilities.

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Project examples

Pelvic Organ Prolapse

Pelvic Organ Prolapse (POP) is a major hidden burden affecting millions of women worldwide. POP is the herniation of bladder, bowel &/or uterus into the vagina. Associate Professor Caroline Gargett from Hudson Institute is focused on developing a therapy for POP using stem cells isolated from the lining of the uterus (endometrium).

A/Prof Gargett's research team will use the Cell Therapies and Regenerative Medicine Platform to develop a robust and reliable method for expanding these stem cells to the numbers and quality needed to repair POP. This optimised method will then form the basis of a clinical trial.

Cells can be continuously maintained in optimal condition

Chronic lung disease in premature newborns

Chronic lung disease is a major hazard for premature newborns, whose lungs are not fully developed at birth. Human amnion cells, derived from the placenta at the time of delivery, have been shown to prevent lung injury.

A research team at Hudson's Institute's Ritchie Centre, led by Prof Euan Wallace and Dr Rebecca Lim, are undertaking a clinical trial to assess the safety of providing these cells to preterm newborns with chronic lung disease. The team use the Cell Therapies and Regenerative Medicine Platform to prepare these cells in a sterile environment and under optimal conditions, to ensure each recipient receives the highest quality cells.

Helping premature newborns

Monash Biobank

The Monash Biobank is an initiative established by Monash Health's Pathology department to support translational research through procurement of human samples.

Biobanking is a key activity underpinning all aspects of biomedical research. Through structured and coordinated biobanking activities, translational research is enabled through the collection of human samples and their associated clinical data. This includes the areas of biomarker discovery, clinical trials or application of new technologies.

Monash Biobank supports translational research at the MHTP through collection of tissue, blood, bone marrow and body fluids (such as ascites and pleural fluid). Samples are processed with diligent standard operating procedures to ensure high quality samples are collected.

The Biobank is hosted within Monash Pathology, which facilitates tissue collection and other ancillary techniques.

Expertise

Dr Beena Kumar is the Principal Investigator of the Monash Biobank. She has extensive experience as an anatomical pathologist in breast and haematolymphoid pathology, and is the designated pathologist for Monash Breast Screen and the Lymphoma Working Group at Monash Medical Centre.

Services

- Assistance with HREC application
- Sample collection and processing following SOP or researcher's protocol (for prospective and specific studies)
- Sample storage and data collection
- Archived tissue retrieval and selection
- Sectioning and Tissue Micro Arrays to suit project requirements
- Immunohistochemistry
- Digital imaging

Contact

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Project examples

Paediatric ependymoma

Our successful case studies are aligned across different research streams, including paediatric tumours, neurological malignancies and pancreatic cancer studies.

Access to paediatric biopsies is always a challenge. The Monash Biobank facilitated an important study conducted by the Hudson Institute through support from the Neurosurgical Department at Monash Health with paediatric ependymoma patients.

Lupus

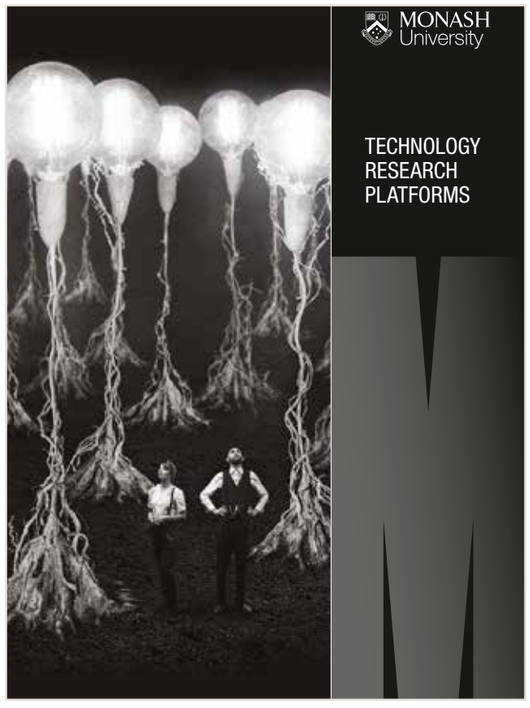
Monash hosts Australia's largest biobanks of clinical samples from patients with Systemic Lupus Erythematosis (SLE), including serum DNA, urine, and live cells. This is linked to detailed clinical data on each patient, providing MHTP researchers and their collaborators, including global biotech and pharma companies, with a unique translational research asset.

Monash Technology Research Platforms

Expanding on MHTP technology capabilities at the Monash Medical Centre, researchers have full access to the integrated network of over thirty world-class technology research platforms at Monash University.

Located on several campuses, Monash Technology Research Platforms are coordinated through the Office of the Vice-Provost (Research and Research Infrastructure).

The MHTP Technology Platforms are fully integrated within the network of Monash Technology Research Platforms, with several operating as a Node of these central University Hub sites.



Monash Technology Research Platforms broad capabilities extend beyond medicine to the disciplines of science and engineering, encouraging a multidisciplinary approach to translational research.

Contact

Platforms.monash.edu

- Centre for Drug Candidate Optimisation
- Fishcore
- Flowcore
- HMSTrust Analytical Laboratory
- MASSIVE
- Micromon
- Monash Academy for Cross & Interdisciplinary Mathematical Applications (MAXIMA)
- Monash Analytical platform
- Monash Animal Research Platform
- Monash Antibody Technologies Facility
- Monash Bioinformatics Platform
- Monash Biomedical Imaging
- Monash Biomedical Proteomics Facility
- Monash Centre for Additive Manufacturing
- Monash Centre for Electron Microscopy
- Monash Drone Discovery
- Monash e-Research Centre
- Monash Fragment Platform
- Monash Gene Targeting Facility
- Monash Genome Modification Facility
- Monash Health Data Platform
- Monash Histology Platform
- Monash Immersive Visualisation Platform
- Monash Instrumentation and Technology Development Facility
- Monash Macromolecular Crystallisation Facility
- Monash Micro Imaging
- Monash Ramaciotti Centre for Structural Cryo-Electron Microscopy
- Monash Statistical Consulting
- Monash Wind Tunnel Facility
- Monash Xray Analytical Platform
- Protein Production Unit
- Robocore
- South East Asia Community Observatory (SEACO)

Monash Pathology

Direct implementation of research results in a clinical setting is enabled through Monash Health's comprehensive range of clinical and laboratory services delivered through Monash Pathology.

Research and the translation of this knowledge to clinical best practice is embedded in the culture of Monash Pathology.

Monash Health pathologists and clinicians in collaboration with MHTP researchers and academics ensure medical research translation to improve healthcare.

An example is the close partnership between our Genetics and Molecular Pathology service and the MHTP Medical Genomics Facility.

Through collaborative research, shared infrastructure, instrumentation, resources and expertise, Monash Pathology is always at the forefront of new genetic test development to deliver world-leading healthcare to our patients.

Monash Pathology services are ISO 15189:2013 accredited and the organisation manages a comprehensive Clinical Trials and Assays program that currently coordinates over 200 projects.

Contact

www.monashpathology.org

Clinical Trials Centre

Clinical trials provide patients with the most innovative treatments and medications available and improve the management of a range of diseases and medical conditions.

To date, the Monash Health Translation Precinct (MHTP) has proudly facilitated more than 200 clinical trials within the state-of-the-art MHTP Clinical Trials Centre. In an Australian first, our unique and distinctive facility supports research conducted at Monash University and the Hudson Institute in collaboration with Monash Health, the largest public health service in Victoria.

Multiple Monash Health departments access the Clinical Trials Centre including Haematology, Oncology, Gastroenterology, Lung and Sleep, Diabetes, Infectious Diseases, Neurology, Stroke, Nephrology, Critical Care and ENT. Our trials are helping patients with a range of diseases and conditions, including Lymphoma, Advanced Solid Tumours, Hepatitis, Cystic Fibrosis and Asthma.

Since opening in December 2015, our dedicated and self-contained clinical research and trials facility has revolutionised how trials are conducted within Monash Health. Our co-location with researchers, on level 3 of the purpose-built Translational Research Facility, enhances collaboration and links between basic and clinical research and patient care, expediting translation of vital discoveries to the bedside.

The MHTP Clinical Trials Centre, directly connected to Monash Medical Centre by a link bridge, contains 10 consulting rooms, 8 clinical beds and 21 treatment chairs dedicated to clinical trials patients and can be accessed 24/7 should a trial require. Dedicated research nurses provide timely and accurate protocol-required data in a professional, warm and inviting environment.

Supported by an on-site DXA machine, a dedicated trials pharmacy and pathology service, the MHTP Clinical Trials Centre offers a one-stop-shop for conducting clinical trials.

Working together with Monash Health's Research Support Services, Monash Health, Monash University and Hudson Institute researchers and coordinators, the Centre supports trials from Phase 1 through to Phase 4.

The MHTP Clinical Trials Centre continues to increase access to a countless number of trials for the fast growing population of Melbourne's South East, and encourages national and international research collaborations.

Contact

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Map & Contact Details

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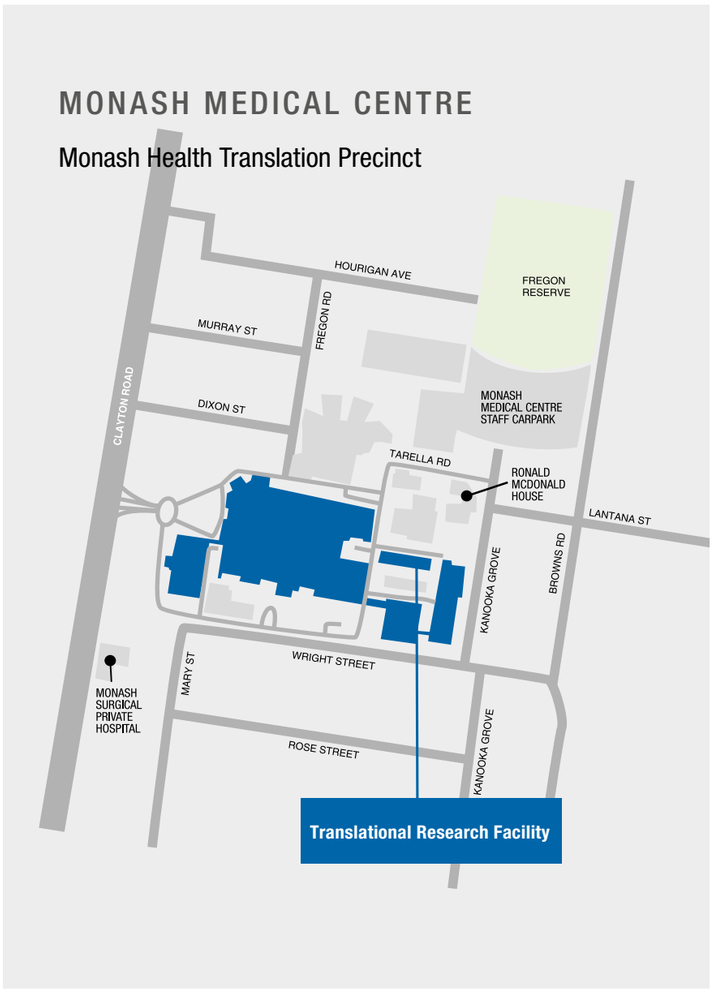

Location:

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