

Westmead Research Hub

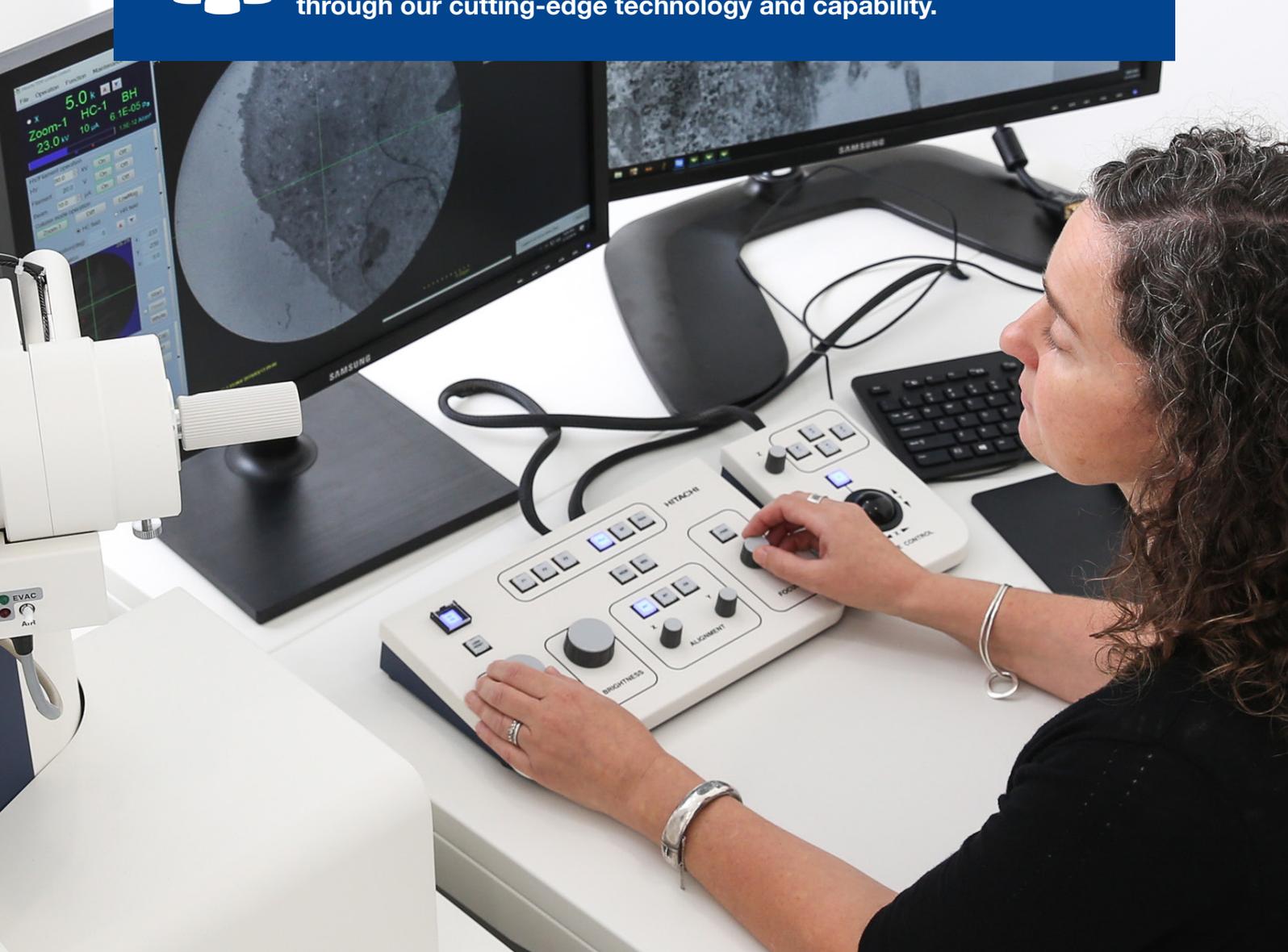
Core Facilities

Our core facilities are the pumping heart of the research effort at Westmead. We are particularly proud of how, as a partnership, we have continually developed our research capability, allowing any groups who use our facilities to remain internationally competitive while also enabling unique opportunities for research collaboration.

The Westmead Research Hub is a collaboration of seven partners working in medical research and innovation on the Westmead Health Precinct. The Hub undertakes projects that encourage collaboration – in sharing both physical resources and brain power of our members. The goal of the Hub is to grow Westmead as a world leader in health and medical research by exercising our strength in numbers. We are dedicated to excellence in the provision of shared Research equipment and service provision through our Core Facilities to support critical research. Our equipment is acquired collaboratively and offered on a fee-for-use basis. Our facilities can be accessed by Westmead researchers, external academic, and commercial users.



We welcome all types of users to our facilities. We would love the opportunity to discuss how we can add value to your project through our cutting-edge technology and capability.



Our Partners



THE UNIVERSITY OF
SYDNEY



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BIOBANKING

Westmead Biobank

Westmead Biobank provides biospecimen processing and storage services for both biobanks and researchers. As a central contact point for a large network of biobanks on the Westmead campus, Westmead Biobank can also assist with researcher requests for biospecimens.



Tissue Micro Array construction

Techniques/Technologies/Services

- Biospecimen processing services
- Specimen Receipt - staff on-call for receipt and tracking of specimens by transfer from clinical collection points in the Westmead precinct, or by courier
- Primary Processing - blood fraction aliquots, formalin-fixed or snap-frozen tissue samples
- DNA/RNA extraction, quantitation and QC – blood, tissue, cultured cells and other sample types
- Histology services - cryosectioning, FFPE sectioning, TMA design and construction
- Specimen dispatch – coordination of specimen dispatch, local and international shipping

Biobank storage facilities

The Westmead Biobank offers storage and retrieval of biospecimens at a range of temperatures. Specimens are accurately tracked, saving users the time-consuming task of inventory management. All freezers and cryotanks have 24hr temperature monitoring and alarm response.

Automated cryostorage

The Askion C-Line HS200 is a robotic LN2 cryotank with automated sample tracking down to single barcoded cryovials. The Askion protects sample integrity with an uninterrupted cooling chain, and enables management of sample collections with increased accuracy and efficiency.

Liquid Handling System

The EpMotion 5075 automatic liquid handler can be configured for various high-throughput applications, including: DNA extraction, aliquotting purified DNA and serial dilutions into multiple 96-well-plates.

More Information

westmead.org.au/biobanking
westmead.biobank@wimr.org.au
Facility located at WIMR



Askion C-Line – fully automated cryostorage tank



Freezer room

BIOINFORMATICS

Westmead Bioinformatics

The bioinformatics service was established mid 2019 to offer bioinformatics support to hub researchers. With over 15 years of experience, we can offer support and/or advice for experimental design through to manuscript preparation for researchers.

Techniques/Technologies/Services

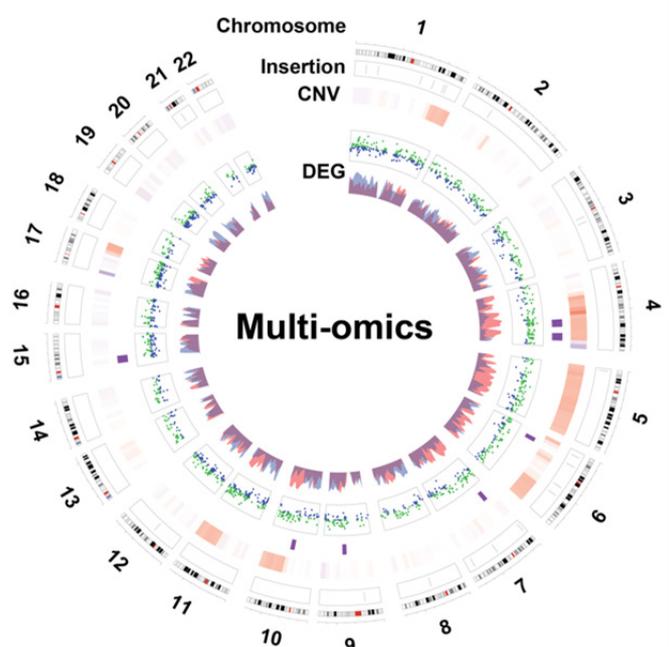
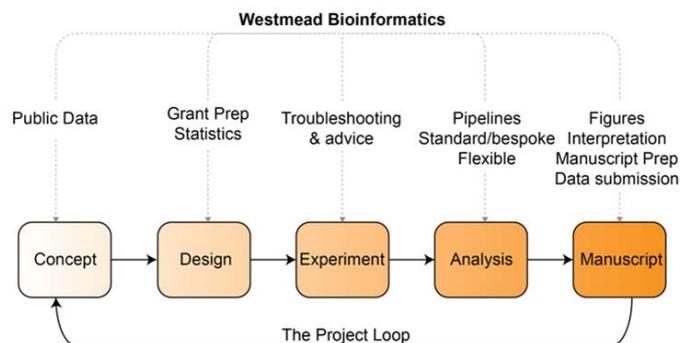
We specialise in data visualisation and offer customised services for analysing a wide variety of experiments from preprocessing to manuscript and grant preparation for

- RNAseq
- Single Cell transcriptomics, VDJ, CITE, ATAC, etc
- Cytometry
- Genomics
- Clone tracking and analysis
- Epigenomics (ChIPseq/ATACseq/BisulfiteSeq)
- Publicly available data analysis/meta-analysis

We can also help you develop your own analysis methods, from deploying software to running bespoke pipelines; email us with your query. We also offer training in standard methods for the above services if people need a head-start in developing bioinformatics skills as well as data visualisation in R and figure making in Adobe Illustrator.

More Information

westmead.org.au/bioinformatics
westmead.bioinformatics@wimr.org.au
Facility located at WIMR



BIORESOURCES

Westmead Bioresources Facility

The Westmead Bioresources Facility is a centralised state of the art small animal facility that is accessible for users across the Westmead precinct. WBF staff are dedicated, experienced and helpful.

From everyday husbandry to specialised techniques, we cater for all project needs and will provide support and suggestions to streamline all projects undertaken within the facility. Working closely with Westmead Pre-clinical Imaging and Histology Facilities, we communicate frequently to facilitate and ensure all user needs are met.

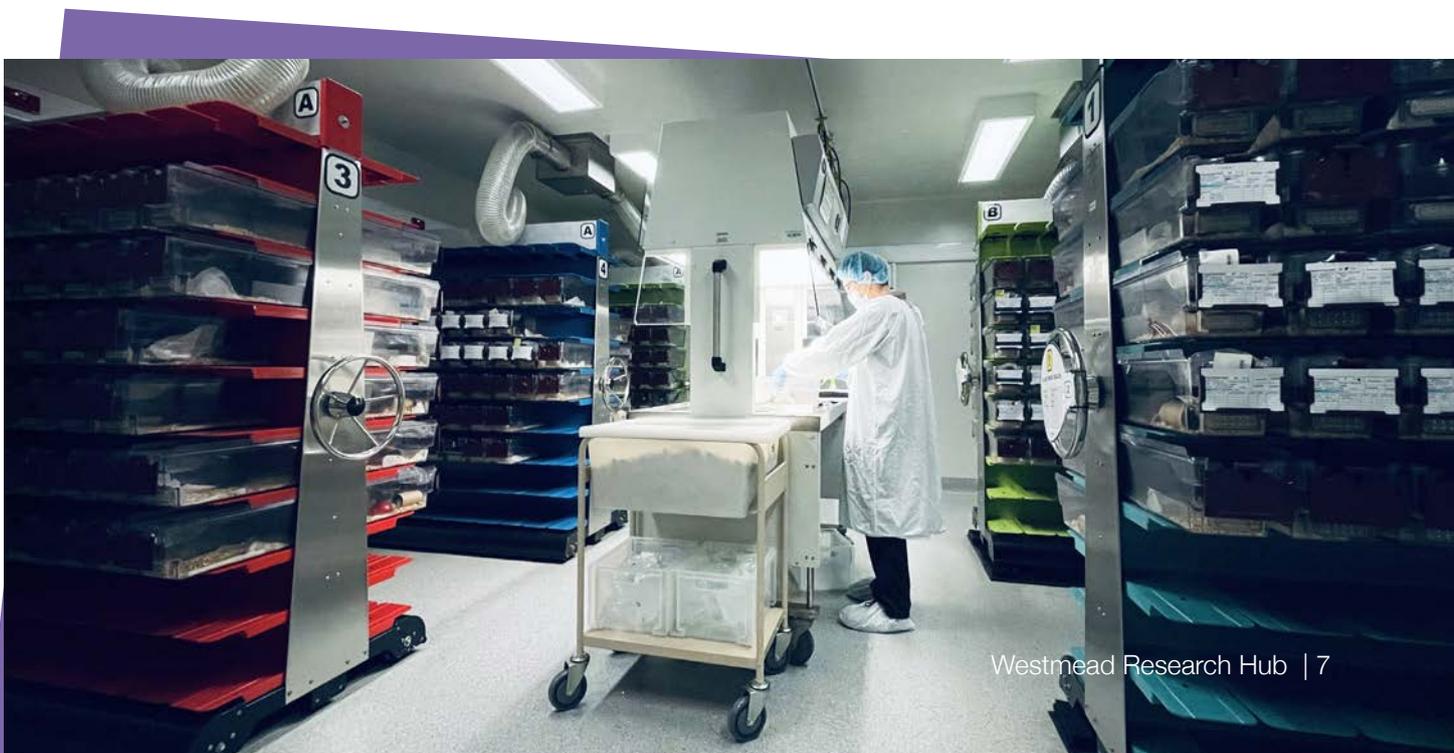
Services and technical assistance

- General animal husbandry
- Animal procurement
- Animal handling techniques and training
- Technical assistance
- Weekend monitoring

More Information

westmead.bioresources@wimr.org.au

Facility located at WIMR



CYTOMETRY

Westmead Cytometry

Westmead Cytometry generates quality data using advanced technologies to facilitate translational medical research.



BD FACSymphony™ A5 Cell Analyzer

Techniques/Technologies/Services

Westmead Cytometry specialises in:

- High dimensional single cell data acquisition & analysis Fluorescence, magnetic and imaging cell sorters
- Training and education of cytometry
- Development of cytometry methods, techniques & instrumentation

Analysers

Westmead Cytometry provides access to digital flow cytometers with up to 50 parameter detection capability. Utilising a number of lasers, tens of thousands of cells or particles can be interrogated per second providing quantitative, multiparametric, high-quality data in a high-throughput platform.

Cell sorting

Cell sorting technologies enable phenotypically identified populations to be single or bulk sorted. Westmead Cytometry provides access to fluorescence, imaging and magnetically activated temperature controlled cell sorters with up to 24 detection parameters.

Data analysis

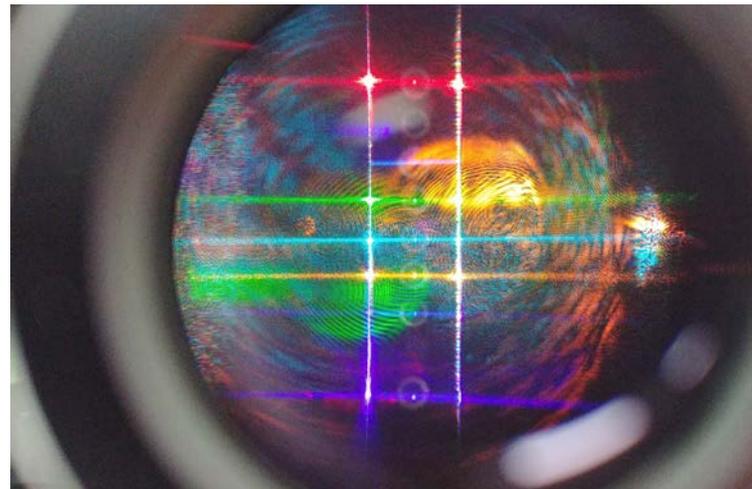
Workstations equipped with analysis software as well as access to high performance computing is provided by Westmead Cytometry in conjunction with Sydney Informatic Hub.

Training & Education

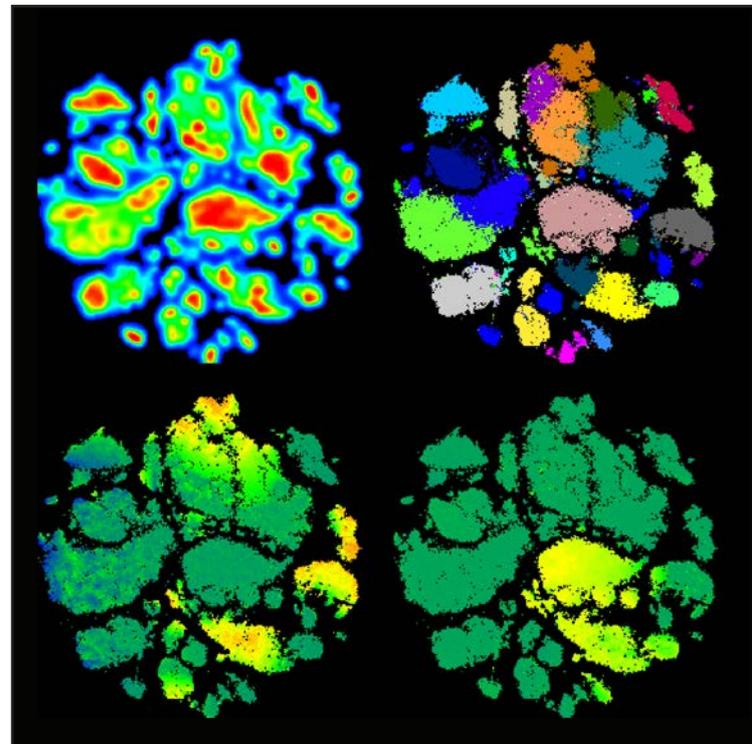
Westmead Cytometry provides instrument training and theoretical education as part of a new user induction. Westmead Cytometry is committed to delivering the latest in research techniques by hosting a number of seminars focusing on specific areas including experimental setup, sample preparation and data analysis.

Development

Westmead Cytometry enables continued developments to facilitate medical research through supporting advanced technologies such as 3D printing, single cell manipulations and microfluidics applications.



Laser beam intersecting sample core



Visualisation of high parameter flow cytometry data using t-distributed stochastic neighbour embedding (t-SNE). Density, cluster, or marker information can be overlaid to understand the cellular phenotype located on an island.

More Information

westmead.org.au/cytometry

westmead.cytometry@wimr.org.au

Facility located at WIMR

ELECTRON MICROSCOPY

Westmead Electron Microscopy

The Westmead Electron Microscopy Facility is a comprehensive laboratory for life science electron microscopy, offering a range of conventional and low temperature preparation techniques for transmission electron microscopy (TEM). It provides access to electron microscopes, an extensive repertoire of technical methods, training, and support to research groups on the Westmead campus and beyond.

Chloroplast ultrastructure in the
Arabidopsis plant



Techniques/Technologies/Services

Ultrastructural Morphology

The WRH-EMF houses two 120kV TEM's for routine ultrathin section analysis.

Macromolecular Analysis

Negative staining provides a quick and easy method for visualising viruses, bacteria, protein, lipid, DNA, and almost any macromolecular complex in the TEM. This technique involves the object of interest being surrounded by a heavy metal stain, allowing the shape, size and surface structure of an object to be studied.

Protein Detection

Immuno-electron microscopy enables researchers to detect a particular protein in a specimen by attaching an electron dense particle to it. This technique can be performed on resin or thawed Tokuyasu cryosections.

Cryo Fixation

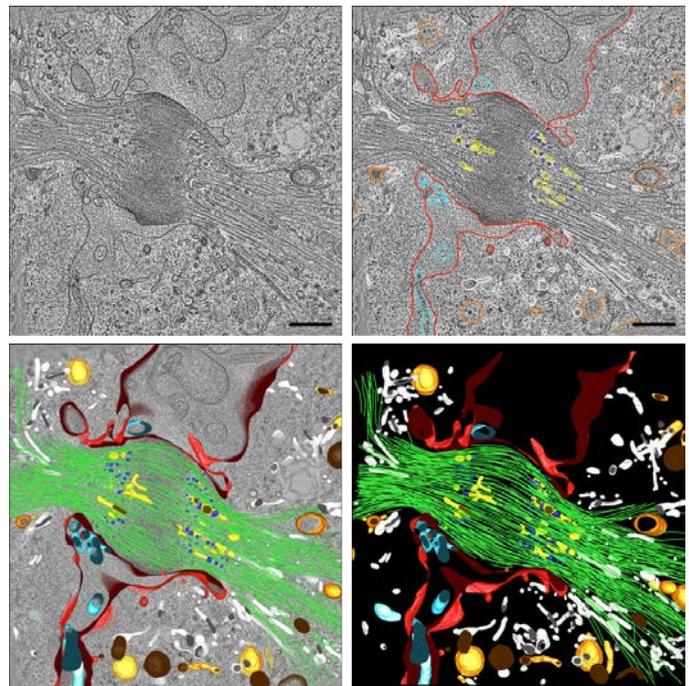
High pressure freezing is used to freeze biological samples in a vitreous state, preventing the formation of any detectable ice crystals. The sample is then fixed, dehydrated and processed to a resin block at low temperature, preventing typical processing artefacts that are introduced during conventional room temperature processing.

Correlative Light and Electron Microscopy (CLEM)

CLEM uses fluorescence microscopy and electron microscopy, to characterize the same cellular structure, by combining contextual information from the light microscope, with the resolution of the electron microscope.

More Information

westmead.org.au/electron-microscopy
westmead.electronmicroscopy@wimr.org.au
Facility located at Westmead Hospital

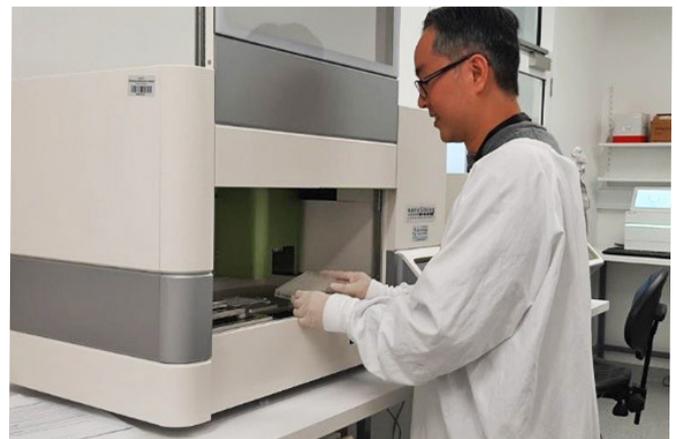


3D reconstruction of the intracellular bridge of a HeLa cell undergoing cell division Kettle et al. Traffic 2015; 16(11) 1174-1192

GENOMICS

Westmead Genomics

The Westmead Genomics Facility provides a specialised environment for conducting high quality and cutting edge genomic research. Our capabilities cover a broad range of genomic, transcriptomic and multiomic applications as well as novel techniques such as single cell and spatial transcriptomic analyses. Facility users will have access to bespoke end-to-end services provided by highly experienced staff and training on all of our instruments.



Fluorescently barcoded oligonucleotide probes allow detection and quantification of gene expression using Nanostring technology.

Techniques/Technologies/Services

Next Generation Sequencing (NGS)

NGS allows massively parallel sequencing of DNA fragments to identify variations in DNA and transcriptomic signatures which uniquely characterize disease and biological states. In collaboration with our partners at the Australian Genome Research Facility (AGRF), we offer end-to-end sequencing services including project planning, DNA/RNA extraction, library preparation, short and long read sequencing and bioinformatics support.

Targeted gene expression analysis

Our facility offers several platforms which allow targeted detection and quantification of gene expression with high sensitivity and accuracy. Our Nanostring nCounter analysis is capable of digitally quantifying expression of 100's of genes simultaneously in a sample while our QX200 Digital Droplet PCR system provides single copy detection sensitivity of target DNA. We also have a suite of real-time PCR machines for quantitative and semi-quantitative PCR.

Quality Control Services

All nucleic acid samples processed by our facility undergo stringent quality control on our Tapestation 4200 system. This provides quantitative assessment of DNA/RNA fragment size and concentrations.

We also perform routine cell line authentication testing according to International Cell Line Authentication Committee (ICLAC) guidelines to meet journal submission requirements for publishing cell line data.



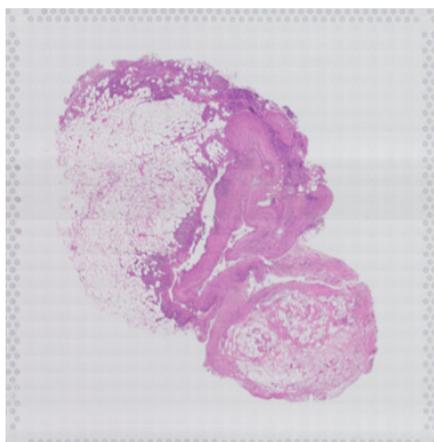
Our Illumina iSeq100 can be used to sequence small genomes from viruses and bacteria as well as PCR products.

Bioinformatics Support

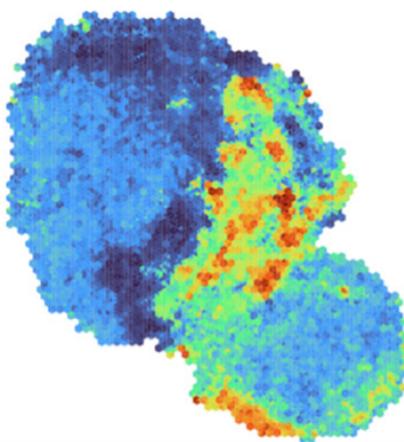
Bioinformatics support is provided by Westmead Bioinformatics (see Bioinformatics section).

More Information

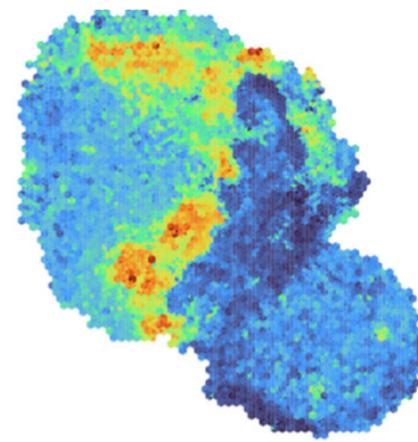
westmead.org.au/genomics
westmead.genomics@wimr.org.au
Facility located at WIMR



H&E stained tissue section



Tumour cells



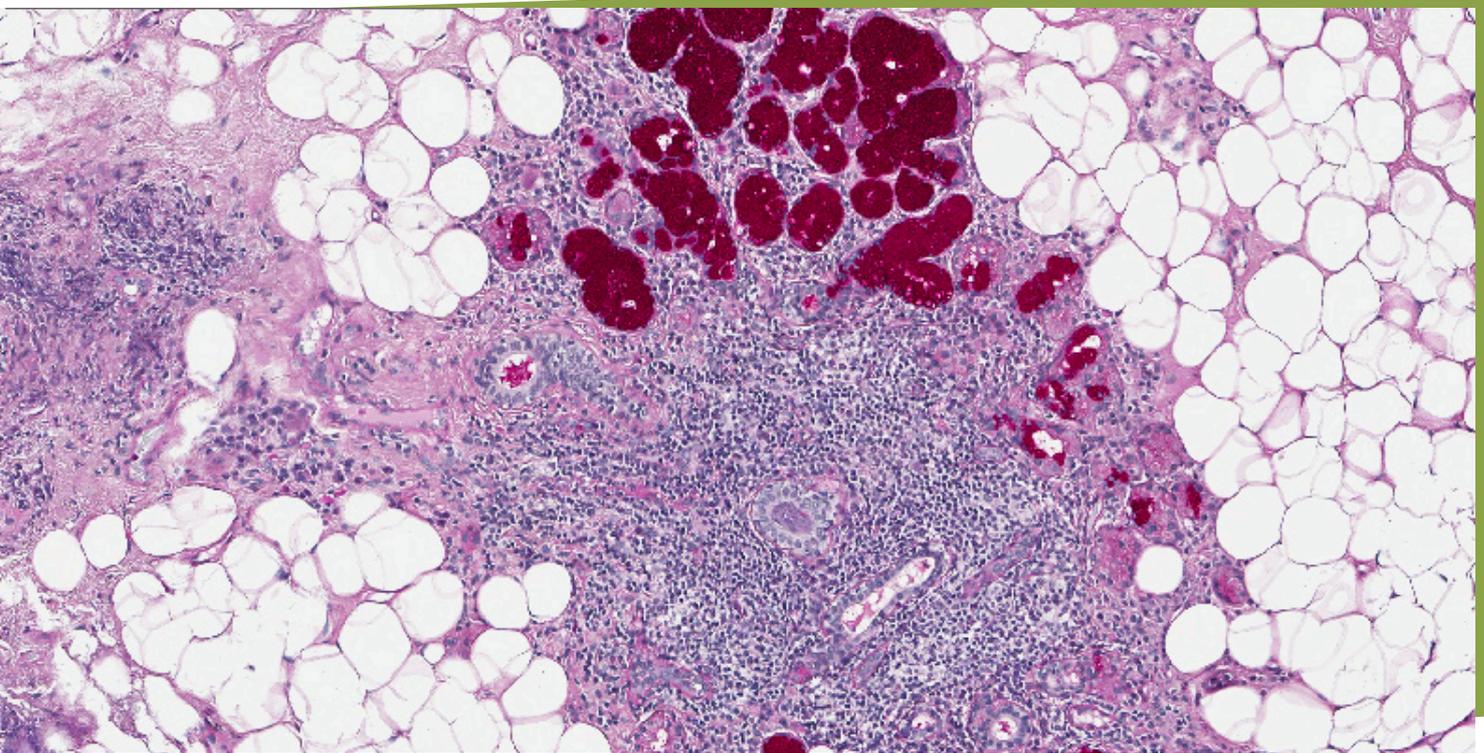
Lymphocytes

Highly multiplex spatial transcriptomic analysis of malignant pleural mesothelioma tissue allows whole transcriptome profiling and unbiased characterization of cell populations and biological states in tissue.

HISTOLOGY

Westmead Histology

The Westmead Histology Facility is a well-established open facility, equipped with modern state of the art equipment. Staff are available to provide training and services for researchers, students, affiliates and commercial users. Histology is used to understand the underlying microscopic details and cellular elements within tissue samples in both healthy and disease states.



Salivary gland showing positive glycogen staining surrounded by fatty tissue by PAS stain

Histochemical Staining

- Hematoxylin and Eosin Stain (H & E)
- Periodic Schiff's Stain (PAS) for glycogen, basement membrane and fungi
- Sirius Red Stain for fibrotic tissue
- Gomori Trichrome Stain for collagen
- Masson's Trichrome Stain for collagen
- Perl's Stain for iron
- Van Gieson's Stain for elastic fibers
- Oil Red O Stain for lipid (for frozen section)

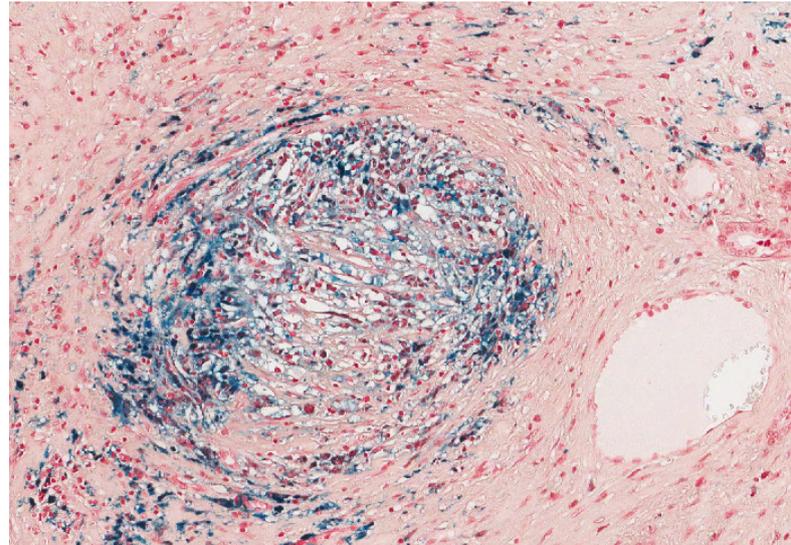
Techniques/Technologies/Services

Westmead Histology has a range of equipment to undertake high quality research, encompassing tissue processing, embedding, and microtomy as well as histochemical staining.

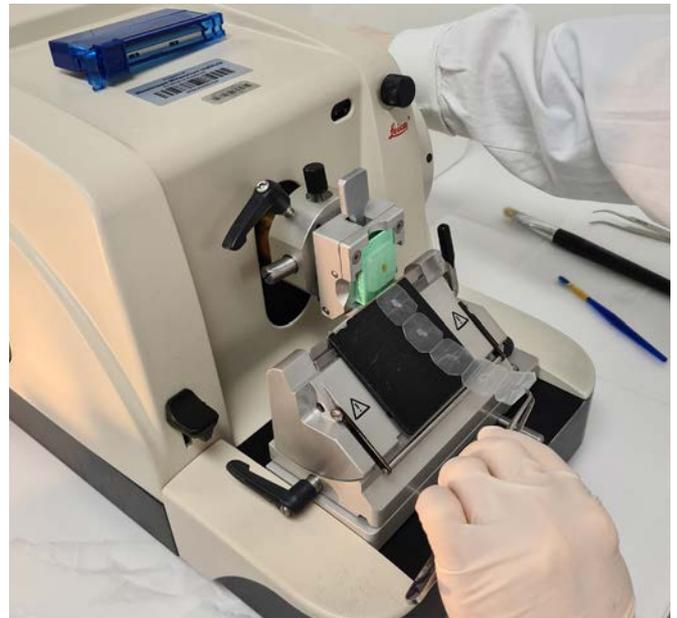
- Tissue Processing/embedding
- Paraffin Sectioning
- Cryo Sectioning
- Antigen Retrieval
- Dehydration/Rehydration

Equipment

- Tissue processor, Excelsior AS
- Embedding Console, Histo Centre 3
- Microtomes, Leica RM2125RT and RM2125RTS
- Cryostats, Microtome HM505E and Cryostar Nx70
- Cassette writer, Printmate AS
- Slide writer, Slidemate AS
- Automatic coverslipper, CTM 6
- Automatic IHC stainer, IntelliPATH FLX



Iron deposition in liver as shown by Perl's stain



Microtomy

More Information

westmead.org.au/histology

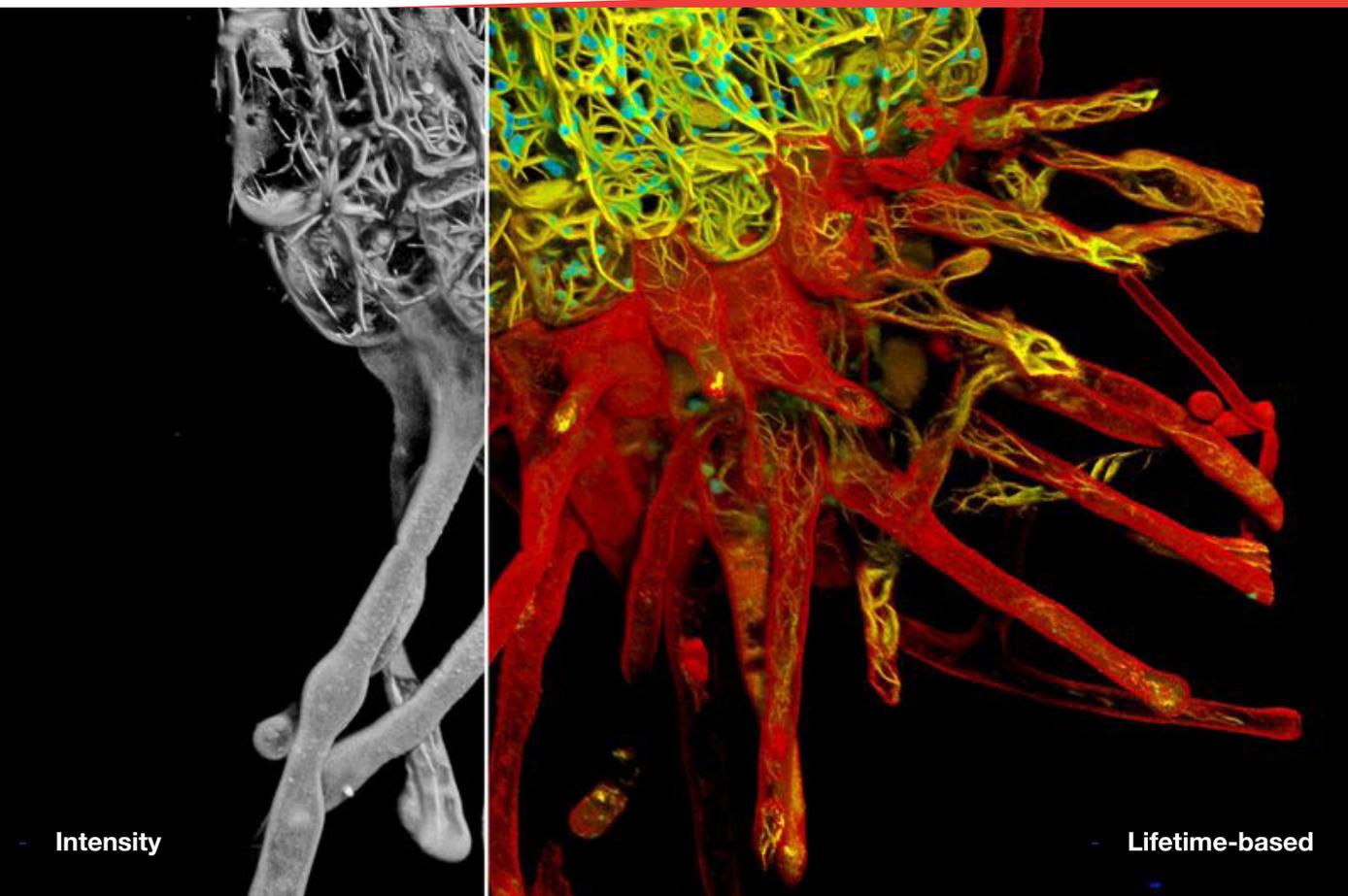
westmead.histology@wimr.org.au

Facility located at WIMR

OPTICAL IMAGING

Westmead Imaging

Seeing is believing!
Microscopy is both a standard part of the biology toolkit and a highly specialised field, so we are here to help you get the best out of your samples with our advanced instruments.



TauSense technology provided on the Leica Stellaris microscope detects photon arrival time revealing additional contrast by lifetime. (Image used with permission from Leica Australia. Root-hypocotyl-junction of *Arabidopsis thaliana* (Era et al. *Plant Cell Physiol.*, 2009). Sample courtesy: Dr. Krebs, COS, University of Heidelberg.)

Techniques/Technologies/Services

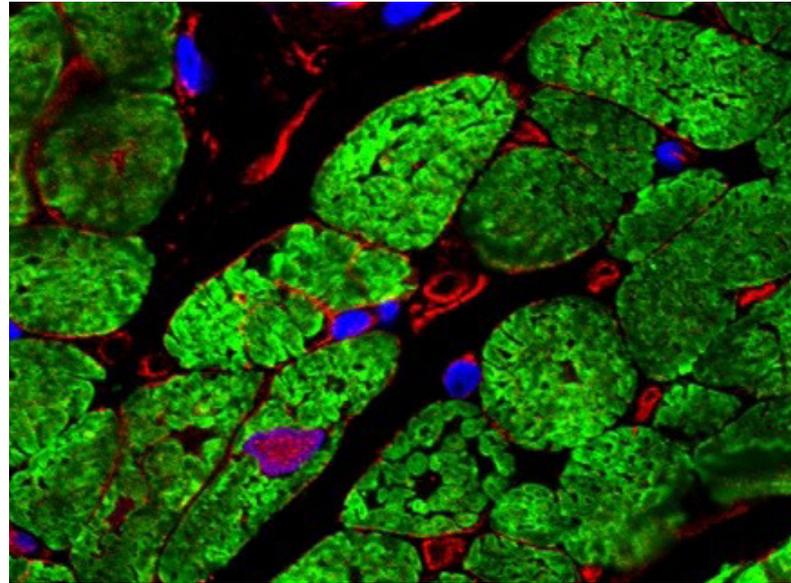
- Standard widefield, brightfield and fluorescence imaging (single-field images of histological and fluorescent labelling)
- Widefield deconvolution microscopy (Deltavision)
- Laser scanning confocal microscopy (SP5 and Stellaris systems)
- Live cell imaging (widefield, Deltavision, confocal, Nanoimager)
- Light sheet microscopy (Leica Stellaris DLS)
- Laser capture microdissection (isolation of cells for downstream proteomics and genomics)
- Super resolution microscopy down to 20nm resolution (Nanoimager)
- High pressure freezing for transfer of samples to electron microscopy
- Analysis computers and advice on image analysis techniques
- Expertise of three facility staff each with over 20 years' experience in microscopy

The staff can also assist you with scanning stage microscopes located in Kids Research and the Westmead Institute for Medical Research including automated large-area imaging of slides (high throughput), multiwell plates and petri dishes under brightfield and fluorescence illumination. Scanning Instruments include: Nanozoomer, Olympus VS120, Aperio ScanScope and Leica DMI8.

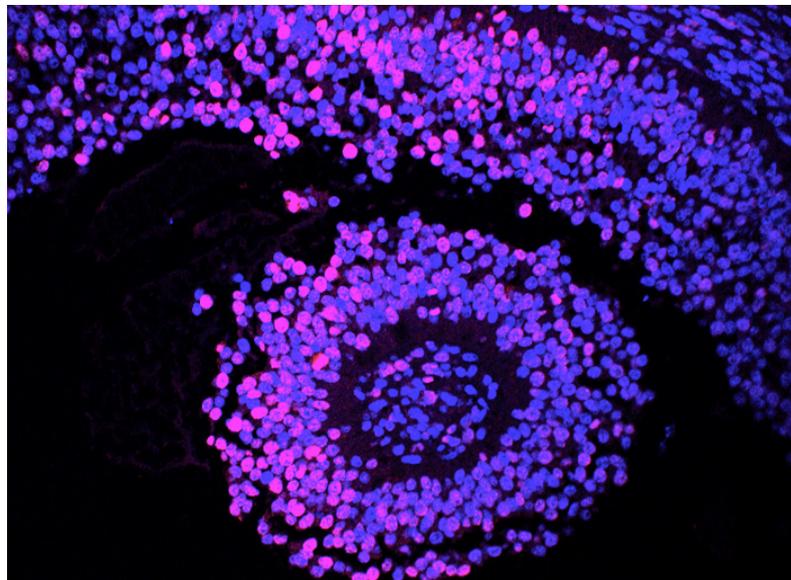
If there are other types of microscopy needed for your experiments, we can help you access instruments elsewhere in the WRH as well as at other microscope facilities across the Sydney region.

More Information

westmead.org.au/cell-imaging
westmead.imaging@wimr.org.au
Facility located at WIMR



Myocardium in a dog heart by Kyi Thant (WIMR)



Pig ovary by Sindu Igoor (WIMR)

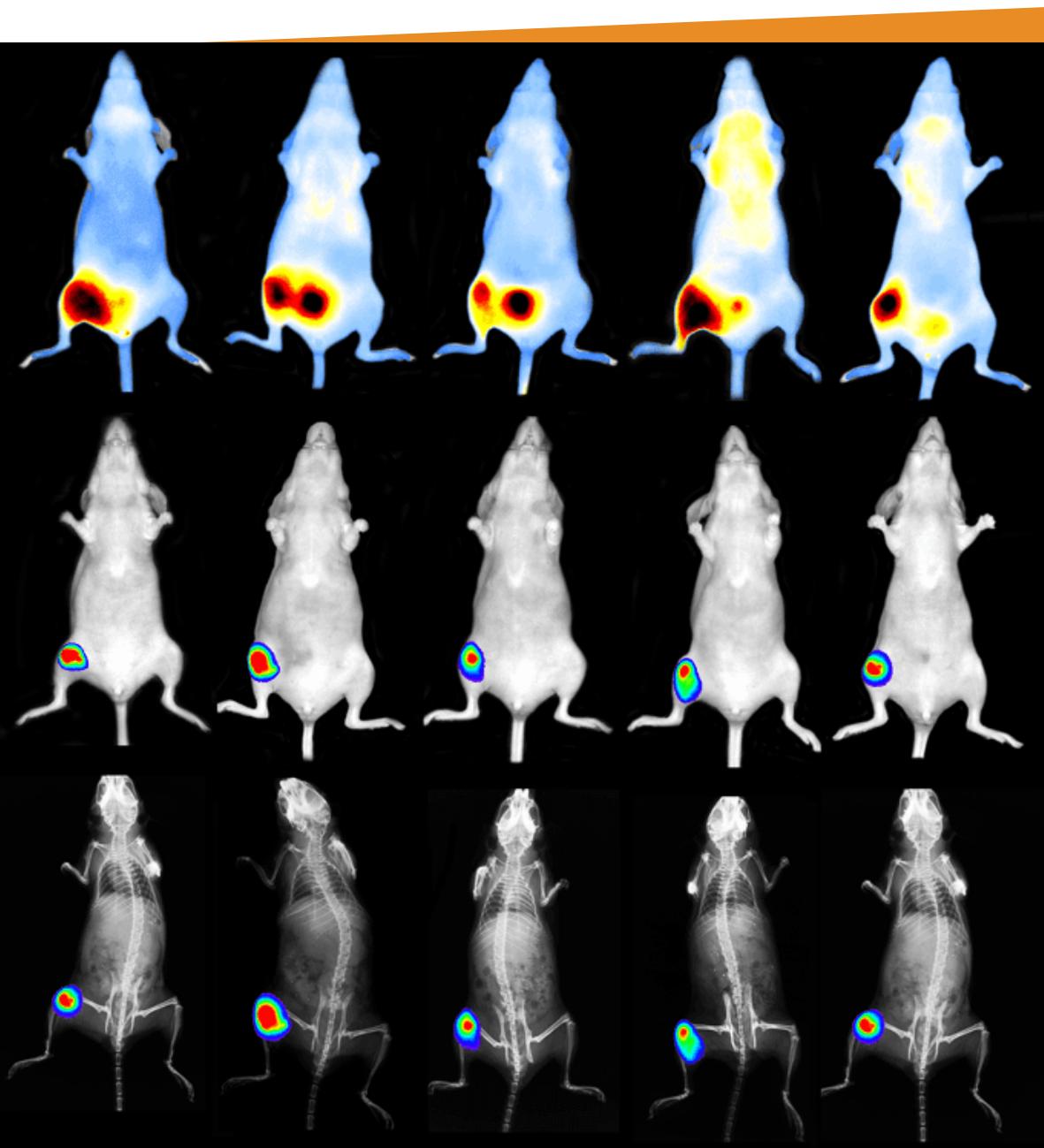


Leica Stellaris 5

PRECLINICAL IMAGING

Preclinical Imaging

Westmead Preclinical Imaging Facility provides an imaging option for healthcare researchers conducting live animal imaging for clinical translation.



The high-throughput system combines high-sensitivity bioluminescence and fluorescence with high-resolution x-ray

Techniques/Technologies/Services

The IVIS Lumina X5 optical imaging system combines high-sensitivity bioluminescence and fluorescence with high-resolution x-ray into a compact system that fits on your benchtop.

Key Features

- Fluorescence imaging: Fluorescence tunability (420 nm – 845 nm)
- Bioluminescence imaging: High sensitivity and high resolution
- X-ray imaging: Add anatomical structure information
- High-throughput system: Up to 5 mice or 2 rats can be imaged together

Specimen that can be imaged

- Live mouse imaging
- Live rat imaging
- Ex vivo tissue imaging

Research Application

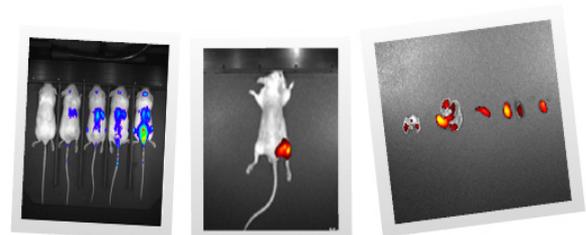
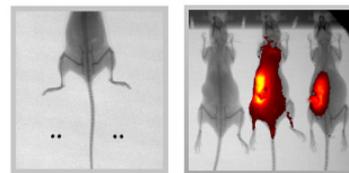
- The IVIS Lumina X5 allows non-invasive and longitudinal monitoring of disease progression.
- Cancer research
- Infectious research
- Immunology
- Drug development

Services we provide

- Consultation on AEC protocol application
- Consultation on experimental design
- Pilot study development
- Training and education
- Animal imaging for users
- Data analysis
- Technical advice
- Collaborations



The IVIS Lumina X5 optical imaging system



Images taken by the IVIS Lumina X5 optical imaging system

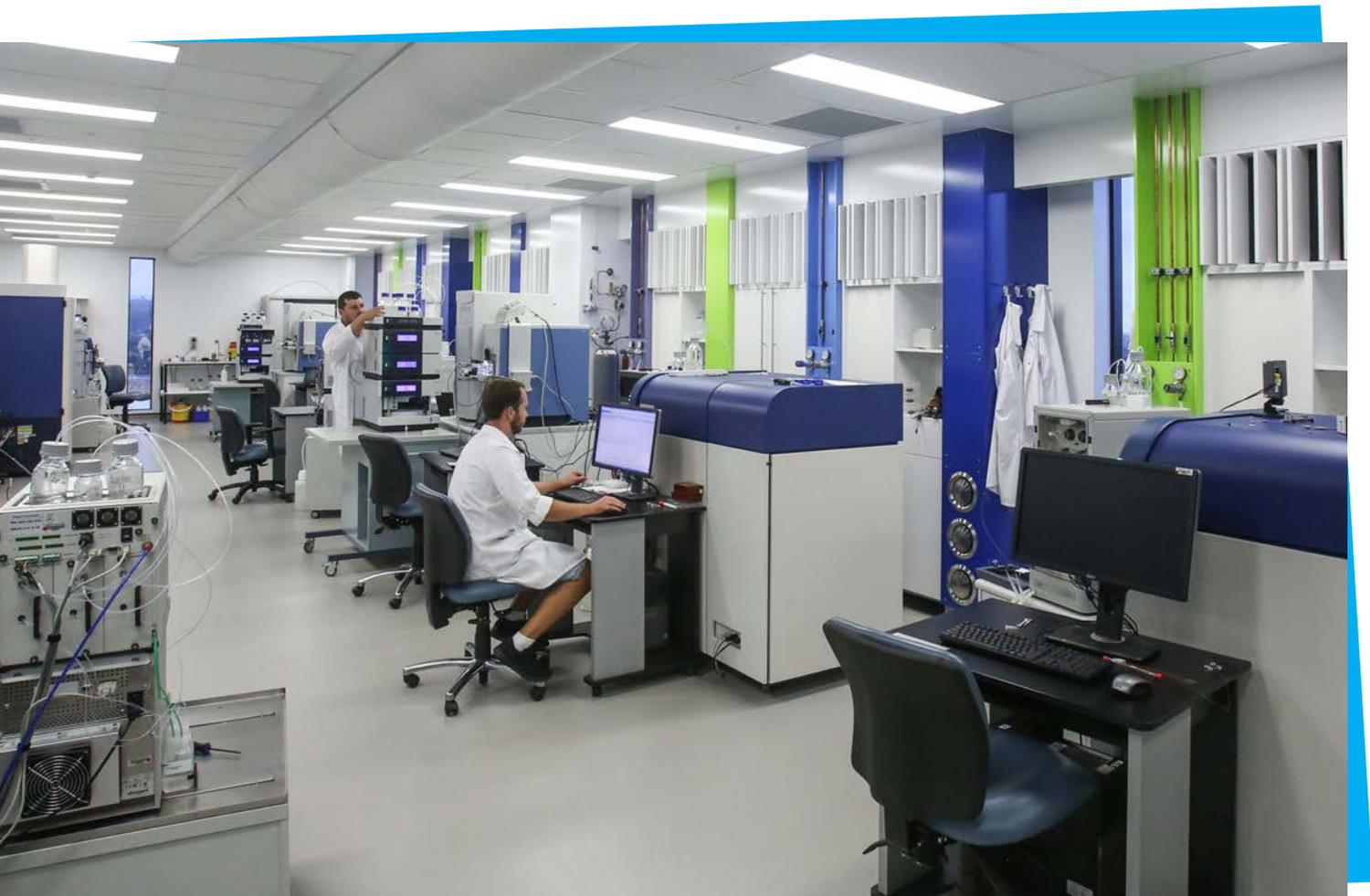
More Information

westmead.preclinicalimaging@wimr.org.au
westmead.org.au/preclinicalimaging
Facility located at WIMR

PROTEOMICS

Biomedical Proteomics

Biomedical Proteomics at CMRI combines applied proteomics with the development of Liquid chromatography-mass spectrometry (LC-MS) - based qualitative and quantitative methods for protein identification and characterisation.



Custom designed instrument laboratory with 10 mass spectrometry systems

Techniques/Technologies/Services

Mass Spectrometry Systems

LC-MS/MS is an extremely powerful analytical tool for the identification, quantitation, and characterization of biomolecules (e.g. proteins, peptides, carbohydrates, DNA, drugs) in cells, tissues, biological fluids, and organisms. Modern LC-MS/MS workflows can identify and measure thousands of proteins and posttranslational modifications. This enables the study of protein-protein interaction, cellular signalling, protein expression and provides insights into the physiological changes occurring between two or more states of interest (e.g. disease vs. control; treated vs. nontreated). Proteomics and phosphoproteomics are the two main services performed at the facility, as well as custom analyses.

LC-MS/MS systems at the Biomedical Proteomics Facility

Two Thermo Q Exactive Plus quadrupole-orbitrap systems enable rapid and confident identification and quantitation of proteins and posttranslational modifications. This highly sensitive work horse equipment enables high depth of proteome analysis and is compatible with the Tandem Mass Tag (TMT) multiplexing technology.

Multiple equipment items to support LC-MS/MS

A Dionex UltiMate 3000 HPLC system supports multiple off-line chromatography workflows with ultraviolet peptide detection and fraction collection to allow greater depth of proteome analysis.

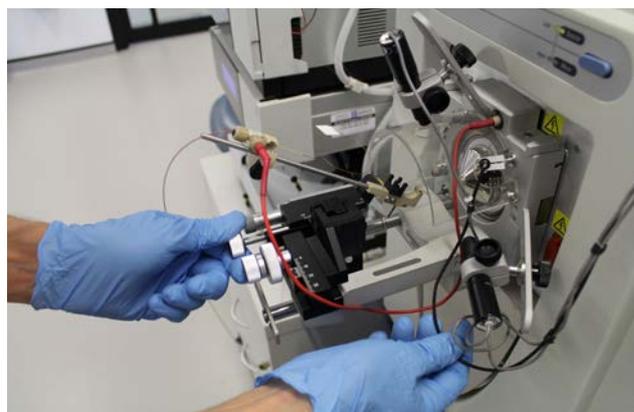
A Laser Puller Sutter Instrument P-2000 and Nanobaume capillary column packer allow the production of nano-flow chromatography columns with a pulled tip. This allows zero dead volume between where the chromatography material and the electrospray emitter, which enables very high-resolution chromatography and sensitive LC-MS/MS detection.

Two Barocyclers

This equipment can process multiple samples at high pressure to speed up and standardise sample preparation steps involving tissue solubilisation and digestion.

Independent use or full service

The facility offers training so that researchers can become independent users of the MS equipment and use the adjoining wet laboratory space. The facility also offers full-service analysis of samples from lysis to LC-MS/MS and data processing. We partner with bioinformaticians to ensure quality outcomes.



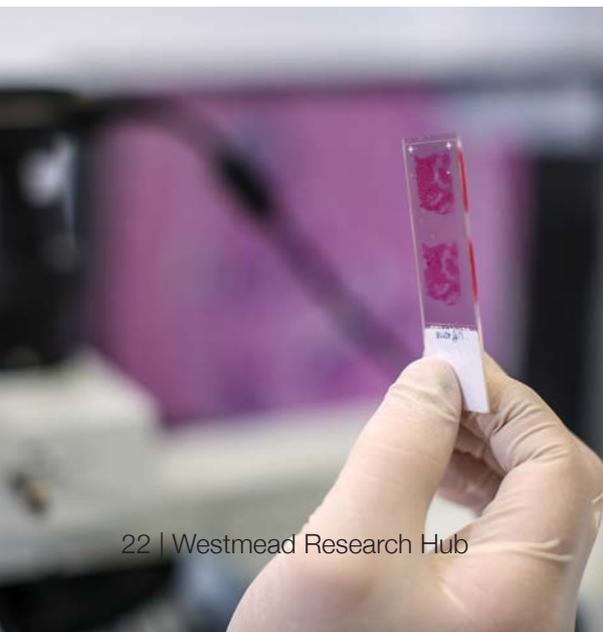
Setting-up a mass spectrometry experiment



Sciex QTrap 5500

More Information

biomedicalproteomics@cmri.org.au
westmead.org.au/biomedicalproteomics
Facility located at CMRI



Westmead Core Facilities Locations

Children's Medical Research Institute (CMRI)

214 Hawkesbury Road, Westmead, 2145

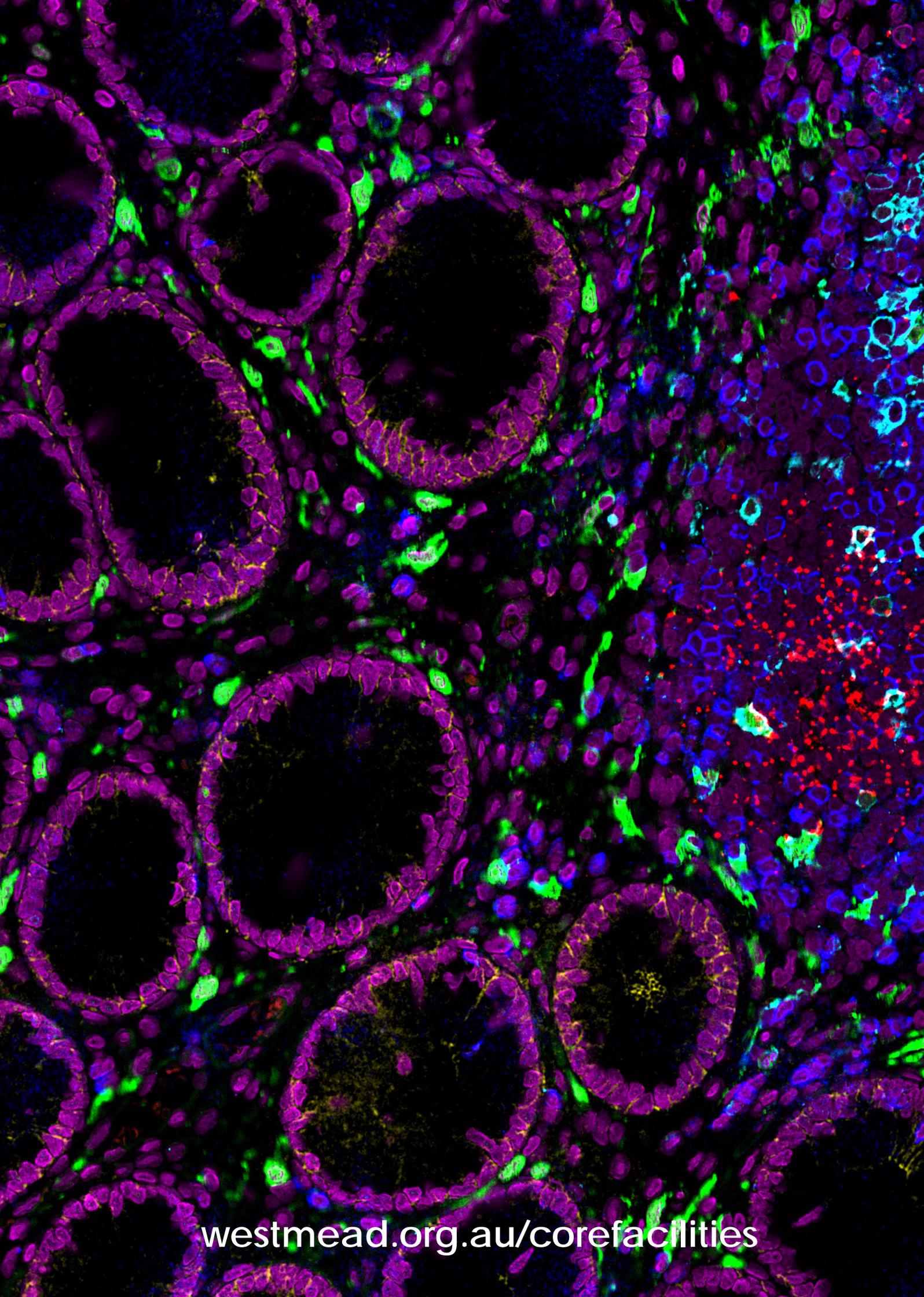
Westmead Institute for Medical Research (WIMR)

176 Hawkesbury Road, Westmead, 2145

Westmead Hospital

Hawkesbury Road, Westmead, 2145





westmead.org.au/corefacilities