



## The Bio21 Cluster

[www.bio21.com.au](http://www.bio21.com.au)

A biomedical, biotechnology research cluster supporting collaborative projects, shared technology platforms, business development and education programs. The twenty one members encompass universities, tertiary health services, medical research institutes, CSIRO and other member-based organisations providing international strengths in biomedical research, education and healthcare. The State Government of Victoria, via the Bio21 Cluster, co-invested in two major developments: the Bio21 Institute and the refitted Joint ProteomicS Facility; and in six collaborative infrastructure projects across the Cluster. The Bio21 Cluster provides a unique platform for innovative discovery from basic science, through translational research, to deliver economic and social benefits.

## Bio21 Developments

### The Bio21 Molecular Science and Biotechnology Institute (The Bio21 Institute)

*The University of Melbourne*

The \$100 million Bio21 Institute is the core physical development within the Bio21 Cluster. It aims to improve human health and the environment through innovation in biotechnology and related areas, driven by multi-disciplinary research and dynamic interactions with industry.

The Institute accommodates in excess of 450 academic and industry participants, making it one of the largest biotechnology centres in Australia. Incubator companies are supported by the Institute's Bio-Innovation Division, which offers business development and industry-targeted programs and events. In 2007, the entire Melbourne-based research and development division of CSL Limited, comprising 55 scientists and support staff, relocated to the Bio21 Institute.

The Institute houses substantial core platform technology facilities for nuclear magnetic resonance spectroscopy, mass spectrometry, high resolution electron microscopy, nanotechnology, biomolecular interactions, rodent research and bioinformatics.

[www.bio21.org](http://www.bio21.org)



### The Joint ProteomicS Facility (JPSF)

*The Walter and Eliza Hall Institute and Ludwig Institute for Cancer Research*

JPSF applies powerful electrophoretic, chromatographic, mass spectrometric and bioinformatic analysis techniques to identify the proteins present in complex mixtures.

The JPSF provides a number of protein identification strategies utilising high-accuracy mass spectrometry for sequencing of peptides for users at the Walter and Eliza Hall and Ludwig Institutes. In addition, the Australian Proteomics Computational Facility has been established to provide a single advanced computing cluster accessible to scientists at proteomics centres all over the country. Services include:

- Protein quantification and 1D-SDS-gel electrophoresis
- Protein analysis of individual Coomassie-blue stained bands
- Mass spectrometry of liquid protein mixtures
- 2D-size exclusion chromatography and 1D and 2D-gel separation of protein mixtures
- N-Terminal sequencing and amino acid analysis
- Consultation on proteomics

[www.ludwig.edu.au/jpsl/jpslhome.html](http://www.ludwig.edu.au/jpsl/jpslhome.html)



# Bio21 Infrastructure Collaborative Projects

## High Throughput Chemical Screening Facility (HTCS)

**Led by The Walter and Eliza Hall Institute**

In today's global pharmaceutical industry, HTCS is the most widely used technology for lead compound discovery. The HTCS screening facility, based in purpose-built facilities, can screen up to 30,000 compounds a day. It is one of only two such facilities in Australia and one of a growing number of HTCS groups based in academic institutions worldwide.

It comprises state-of-the-art automation systems and a unique collection of 100,000 diverse, lead-like chemicals. It is designed to provide maximum flexibility in terms of the types of assays and assay technologies that can be employed.

[www.wehi.edu.au](http://www.wehi.edu.au)

## Molecular Medicine Informatics Model (MMIM)

**Led by Melbourne Health**

Improvements in healthcare and understanding of disease processes depends, in part, on the ability to analyse complex integrated patient data held in different databases by different organisations. The Bio21:MMIM is the platform and infrastructure that provides researchers access to thousands of records of patient data in many disease types and from independent, existing databases at many institutions. The data, which are co-located in a virtual repository, can be linked with publicly available research and genetic profiling data. The system provides widespread authenticated access while protecting both privacy and intellectual property.

The MMIM covers the areas of cancer, neurosciences, diabetes, and cystic fibrosis. It has nodes at many sites in Victoria and is in various stages of implementation in other Australian States. International sites are also actively discussing joining.

[mmim.ssg.org.au](http://mmim.ssg.org.au)

## 800 MHz Nuclear Magnetic Resonance Spectrometer (NMR)

**Led by The Bio21 Institute, University of Melbourne**

Access to NMR spectroscopy operated at very high magnetic fields (ultra high-field NMR) is essential to Bio21's capabilities in the discovery and development of new drugs and other biopharmaceuticals (e.g. agrichemicals, including safe pesticides).

The massive 800 MHz NMR, equipped with cryoprobe technology, is the centrepiece in the suite of nine NMR instruments held in the "NMR Cave" at the Bio21 Institute. The instrument has substantially increased sensitivity and can elucidate structures of normally intractable proteins in solution. It complements the capabilities of the Australian Synchrotron and the Bio21 Institute's high resolution cryo-electron microscopy facility and completes a suite of protein structure discovery tools.

[www.bio21.org/platform-technologies](http://www.bio21.org/platform-technologies)

## Collaborative Crystallisation Centre (C<sup>3</sup>)

**Led by CSIRO Molecular and Health Technologies**

The major hurdle in protein crystallography is the difficulty of obtaining protein crystals (and their complexes with ligands or chemical compounds) that diffract X-rays to high resolution.

C<sup>3</sup> provides techniques that radically improve the process of protein crystallisation:

- Robotic preparation and dispensing of mother liquors
- Robotic preparation of nano-volume crystallisation trials
- Crystallisation trials performed in microfluidic chips
- Automated imaging and computer-based management of crystallisation trial conditions
- Dynamic light scattering assessment of protein crystallisation potential.

[www.csiro.au/c3](http://www.csiro.au/c3)

## Enhanced Sharing and Management of Bioresources

**Led by St Vincent's Health**

Use of mouse models of disease underpins much biological research. The Bioresources Project provided equipment to maintain health standards in the participating mouse facilities, to allow free interchange between facilities as well as external transfer. Development and implementation of Common Health Standards was a critical element to successfully achieving animal interchange and these Standards are available to others designing new animal facilities.

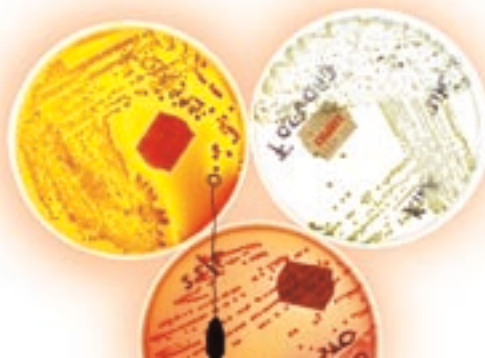
While numerous genetically modified and mutant mouse models exist, holdings in various research organisations are rarely catalogued. An integrated database of mouse holdings allows researchers to determine easily if and where particular strains are located. Holdings in participating Bio21 research nodes, will be integrated into the Australian Phenomics Network, a central hub for access to information on local and international animal models.

## Facilities for Human Cellular Diagnosis and Therapy

**Led by St Vincent's Institute**

Manipulation and transplantation of isolated cells, rather than whole organs or tissues, is an emerging area of diagnostic and therapeutic medicine. This project is developing a strong framework for translational cell therapy research in Victoria by:

- Establishing a facility for flow cytometric isolation and analysis of human cells before and after cell therapy.
- Completion of containment laboratory facilities that will greatly enhance the capability for paediatric cell therapy studies.
- Demonstrating the effectiveness of non-haemopoietic cellular therapies in treating disease, especially type 1 diabetes.



# Members of the Bio21 Cluster

## Austin Life Sciences

[www.austin.org.au](http://www.austin.org.au)

Austin Life Sciences, represents a unique collaboration of expertise, technologies and intellectual capital. Located at Austin Health, the Alliance is a research and development enterprise integrating independent research groups with a vision of "Turning science into health" by using common platform technologies to address a variety of clinical problems.

## Bionic Ear Institute (BEI)

[www.bionicear.org](http://www.bionicear.org)

The Bionic Ear Institute is a world leader in multidisciplinary research involving medical bionics and its clinical application. Iconic projects include: high-fidelity Bionic Ears to allow the deaf to enjoy music; targeted drug delivery systems for nerve and spinal cord repair; brain implants to monitor, diagnose and treat epilepsy and the development of a Bionic Eye (retinal prosthesis).

## Cancer Council Victoria

[www.cancervic.org.au/about-our-research](http://www.cancervic.org.au/about-our-research)

An independent volunteer-based charity that conducts and supports research, delivers state-wide support and prevention programs and advocates regulation and other interventions to reduce the physical and emotional burden of cancer. We conduct research in cancer epidemiology, behavioural science and tobacco control, administer state, national and international clinical trials, and provide a range of funding opportunities for cancer research in Victorian institutions.

## Cancer Trials Australia (CTA)

[www.cancertrialsaustralia.com](http://www.cancertrialsaustralia.com)

Cancer Trials Australia is an established cancer clinical trials collaboration between four major hospitals and three cancer research institutes. CTA's strength is in early phase trials with an emphasis on functional imaging and translational studies through a dedicated trials laboratory. The single administrative hub provides individual trial project management.

## CSIRO Molecular and Health Technologies (CSIRO MHT)

[www.csiro.au/org/cmht.html](http://www.csiro.au/org/cmht.html)

CSIRO Molecular and Health Technologies chemists, biologists and material scientists work in partnership to address key challenges in health and in a range of industries requiring smart materials. The commitment to applying multi-disciplinary science to complex problems in health and advanced materials is supported by a range of capabilities through research themes:

- Biomaterials and Regenerative Medicine
- Electroactive Materials
- Australian Biotech Growth Partnerships
- Nanobiotechnology

## Howard Florey Institute (HFI)

[www.florey.edu.au](http://www.florey.edu.au)

The Howard Florey is an internationally renowned research Institute focused on neuroscience. The Florey has experienced rapid growth and has attracted outstanding scientists to its laboratories at the University of Melbourne, Australia: currently around 300 staff work in eight different research teams. Some research areas include Parkinson's disease, stroke, motor

neurone disease, traumatic brain and spinal cord injury, addiction, epilepsy, multiple sclerosis, brain development in premature babies, autism, heart failure and memory loss.

## Ludwig Institute for Cancer Research (LICR)

[www.ludwig.edu.au](http://www.ludwig.edu.au)

The Ludwig Institute for Cancer Research is an international non-profit organisation that aims to improve the understanding and treatment of cancer through integrated laboratory and clinical research. Research and clinical facilities are situated in two separate branches in Parkville and at Austin Health. The research focus is on characterisation of cytokines, growth factors and receptor signalling events that influence the growth of human tumours. The research programs combine with clinical activities to create new opportunities for the development of effective anti-cancer treatments.

## Melbourne Health (MH)

[www.mh.org.au](http://www.mh.org.au)

Melbourne Health, incorporating Royal Melbourne Hospital, Victorian Infectious Diseases Reference Laboratory and North West Mental Health, has internationally recognised teaching and research facilities in the acute, sub-acute and community settings. The service has a focus on clinical research in oncology, neurosciences, infectious disease, diabetes, colorectal cancer and mental health. Quality clinical trials that meet regulatory requirements are a particular strength.

## Mental Health Research Institute of Victoria (MHRI)

[www.mhri.edu.au](http://www.mhri.edu.au)

Using laboratory and clinical research, scientists at the Mental Health Research Institute study the normal and abnormal brain to improve diagnosis and treatment of:

- Alzheimer's Disease and other neurodegenerative diseases including Parkinson's, Creutzfeldt-Jacob, and Huntington's diseases, frontotemporal dementia and amyotrophic lateral sclerosis
- Schizophrenia and major psychoses
- Depression, Bipolar Disorder and other mood disorders

## Murdoch Children's Research Institute (MCRI)

[www.mcri.edu.au](http://www.mcri.edu.au)

The Murdoch Children's Research Institute is the largest research centre in Australia specialising in child health. Uniquely located within the Royal Children's Hospital, it is distinguished by the ability of over 500 researchers to combine innovations in community health and medical laboratory research with clinical know-how. Our aim is to ensure the best health for babies, children and young people.

## Neurosciences Victoria Ltd (NSV)

[www.neurosciencesvic.com.au](http://www.neurosciencesvic.com.au)

NSV is a company representing the world-class neuroscience biocluster in Melbourne, Australia. It offers a broad portfolio of neuroscience research, opportunities in licensing, co-development, drug validation and testing, drug discovery and development technology platforms, collaborative R&D, animal modelling, spin-off company equity, participation and access to coordinated neuroscience clinical trials.

# Members of the Bio21 Cluster *continued*

## **National ICT Australia Victoria Research Laboratory (NICTA)**

[www.nicta.com.au](http://www.nicta.com.au)

NICTA is the national ICT Centre of Excellence, funded by the Australian Research Council (ARC), the Australian Government Department of Communications, Information Technology and the Arts, (DoCITA) and its members and partners. At the Victoria Research Laboratory activity is focused on creating technologies for two areas: building, managing and exploiting the networks of the future and contributing to the development and implementation of personalised medicine.

## **ORYGEN Research Centre (ORC)**

[www.orygen.org.au](http://www.orygen.org.au)

ORYGEN Research Centre brings together clinical, academic and corporate/philanthropic groups in close partnership and is the leading research organisation in youth mental health in Australia. The basic neuroscience and clinical research program at ORC, aims to understand the biological, psychological and social factors that influence onset, remission and relapse of mental illnesses that emerge in adolescence and early adulthood, in order to find better ways to prevent and/or reduce the impact of mental disorders. The program focuses on the full range of mental disorders that impact on young people, including depression, substance use disorder, bipolar disorder, borderline personality disorder and eating disorders.

## **Peter MacCallum Cancer Centre (Peter Mac)**

[www.petermac-research.org](http://www.petermac-research.org)

The Peter MacCallum Cancer Centre is Australia's only comprehensive cancer centre and is uniquely placed to make a major contribution to fundamental and clinical cancer research integrated with the treatment of cancer patients. Our laboratory-based research and clinical research programs cover a wide spectrum: from studies into the basic mechanisms of cell growth, translational studies that seek more accurate cancer diagnosis, clinical trials with novel treatments, to research aimed at improving our supportive care approaches.

## **Royal Children's Hospital (RCH)**

[www.rch.org.au](http://www.rch.org.au)

The Royal Children's Hospital is a specialist paediatric teaching hospital and provides a full range of clinical services, tertiary care and illness prevention programs for children and adolescents. As the major paediatric hospital in Victoria, the RCH provides clinical, academic and advocacy services for children and young people throughout the State. As well, patients are referred to the RCH from all over Australia and from Asian-Pacific region countries. It is internationally recognised as a leading centre for research and education. The Murdoch Childrens Research Institute is based at the RCH, providing a bench to bedside process within the site.

## **Royal Women's Hospital (RWH)**

[www.rwh.org.au](http://www.rwh.org.au)

The Royal Women's Hospital is Australia's largest speciality hospital dedicated to improving the health of all women and newborn babies throughout the journey of life. The RWH is committed to a holistic philosophy of health and provides comprehensive health services ranging from health promotion to clinical intervention.

The RWH also provides clinical expertise and leadership in maternity services, gynaecology, cancer services and care of newborn babies.

## **St. Vincent's Health (SVH)**

[www.svhm.org.au](http://www.svhm.org.au)

St. Vincent's Health is a three-campus tertiary health service and teaching hospital of the University of Melbourne. Major clinical and research foci include cancer, mental health, transplantation immunology and neurosciences. Co-located research institutes include St. Vincent's Institute, the Bernard O'Brien Institute of Microsurgery and components of the Howard Florey Institute.

## **St Vincent's Institute (SVI)**

[www.svi.edu.au](http://www.svi.edu.au)

SVI conducts basic and clinical research programs into high impact community diseases including bone diseases (osteoporosis), cancer, metabolism (obesity/cardiovascular disease), diabetes, neurological diseases and infection. Skills include protein chemistry, structural biology, bone biology and virology. SVI is an independent Institute, affiliated with St Vincent's Health and Melbourne University.

## **The University of Melbourne**

[www.unimelb.edu.au](http://www.unimelb.edu.au)

The University of Melbourne is an internationally-focused, research-intensive University with over 5,000 staff and 30,000 students. It is the largest research University in Australia, with more than 3000 research higher degree students and a research income greater than \$250 million. The University's research strengths span most fields of biomedical science ranging from fundamental research into the molecular basis of disease through to applied clinical research. The Bio21 Institute is a major focus for the University's biotechnology efforts.

## **The Walter and Eliza Hall Institute (WEHI)**

[www.wehi.edu.au](http://www.wehi.edu.au)

WEHI has an international reputation built upon major contributions to immunology, haematology, cancer, malaria and autoimmune diseases. By combining its strengths in structural biology, high throughput chemical screening and medicinal chemistry with those in biology, WEHI provides unique opportunities for translation of basic biology and drug targets into potential clinical candidates.

## **Victorian College of Pharmacy (VCP)**

**Monash University**

[www.vcp.monash.edu.au](http://www.vcp.monash.edu.au)

The Victorian College of Pharmacy at Monash University is a key research centre in the Pharmaceutical Sciences and Pharmacy. The breadth of disciplines includes drug discovery, drug development and drug evaluation. A key element of the drug discovery and development portfolio is the Centre for Drug Candidate Optimisation (CDCO).



[www.bio21.com.au](http://www.bio21.com.au)