

## Royal Adelaide Hospital

Co-Director of Research – Professor Donald W Howie

Clinical Director – Orthopaedic and Trauma Service  
Royal Adelaide Hospital

Professor and Head – Department of Orthopaedics and  
Trauma, University of Adelaide

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### *The Department of Orthopaedics & Trauma, Royal Adelaide Hospital and Adelaide University*

The Department of Orthopaedics and Trauma is a separate Department of the Adelaide University within the Faculty of Medicine and shares resources with the Department of Orthopaedics and Trauma at the Royal Adelaide Hospital. As a Department based within a university and a major teaching hospital, it is ideally suited to undertake research.

The Department has access to facilities and expertise from within both the Royal Adelaide Hospital and the Adelaide University. Given that the Hospital administers two major diagnostic and research institutions: the Institute of Medical and Veterinary Science (IMVS) and the Hanson Institute, our Department also has access to the expertise and facilities within these two highly regarded research establishments.

The Hanson Institute enhances the research efforts within the Royal Adelaide Hospital, IMVS and the Adelaide University and forms the focus for cancer and other research in South Australia. Quality medical oncology, cell biology, molecular biology and gene therapy research is undertaken in this institution. The Department of Orthopaedics and Trauma has its Bone Cell Laboratory in this Institution and collaborates closely in its studies on stromal cell lineage, cancer and molecular biology. The Department of Orthopaedics and Trauma has numerous collaborative research programs, and shares research facilities with the Department of Pathology, Adelaide University and the Division of Tissue Pathology, IMVS.

There are state-of-the-art animal operating facilities and accompanying veterinary support, both within the IMVS and at the Institute's field station, which offers both short-term and long-term animal holding facilities. The Department utilises these animal services in its large and small animal research programs.

The Department of Orthopaedics and Trauma of Adelaide University and the Royal Adelaide Hospital has gained national and international recognition as a centre of excellence for its clinical practice, teaching and research programs.

### ***Collaborative Research***

The nature of medical research generally requires a multi-disciplinary approach and the Department has developed substantial links with more than 20 other departments and institutions both in Australia and overseas. These collaborations are essential if the research effort is to provide future improvements in clinical management.

This Department makes special recognition of the collaborative efforts of the Department of Pathology, University of Adelaide and the Division of Tissue Pathology, IMVS. Professor Barry Vernon-Roberts, who is an internationally renowned expert in musculoskeletal pathology, directs both of these collaborative groups. These efforts, led by Professor Vernon Roberts, Assoc Professor Nick Fazzalari (Tissue Pathology-bone pathology, histoquantitation and mechanics), Dr David Haynes (Dept of Pathology - *in vitro* wear program) and Dr Robert Moore (Co-Director of Adelaide Spinal Research Centre) have been fundamental to the previous and current success of many of our research programs and in particular the studies of wear, spinal pathology and trauma pathology.

The Department also undertakes commercially funded research for orthopaedic and other medical companies.

### **Research Personnel & Education**

#### ***Clinical Research Fellowship Programs***

The Department has recognised fellowship programs for joint replacement, spinal disorders, sports medicine and upper limb reconstruction and trauma. Most of the Fellows are from overseas and actively participate in clinical management and surgery, protocol development and research projects in these specialty areas. The success of the fellowship programs has resulted in the international interest that it currently receives. The Department is also a host to a number of visiting Fellows and short-term trainees who come mainly from Malaysia and South East Asia.

### **Honours, Masters & Doctoral Research Students**

Post graduate Coordinator – Dr O Holubowycz

The Department offers postgraduate research programs (PhD, MS & MMedSc.) in clinical orthopaedics, cell biology and epidemiology. Potential candidates are invited to discuss research interests with potential supervisors and The Postgraduate Co-ordinator.



## Major Research Programs

### *Major Research Interests*

The major research interests of the Department of Orthopaedics and Trauma are the cell and molecular biology of bone and cancer of bone, osteoarthritis, total joint replacement, spinal disorders, trauma, orthopaedic implant devices, management of upper and lower limb injury and biomaterials. Basic and clinical research is undertaken in all these areas. The Department also has a heavy investment in prospective outcomes evaluation in the areas of orthopaedics, spinal and trauma. These results are used to assist with clinical decision-making regarding best practice.

#### ***Bone Cell Biology***

Director of Program:

Associate Professor David Findlay (right),  
E-mail: david.findlay@adelaide.edu.au.

Location:  
Orthopaedic Bone Cell Laboratory.  
Hanson Centre for Cancer Research, Level 2,

Staff:  
Dr Gerald Atkins, Dr Andreas Evdokiou, Shelley Hay, Katie  
Welldon

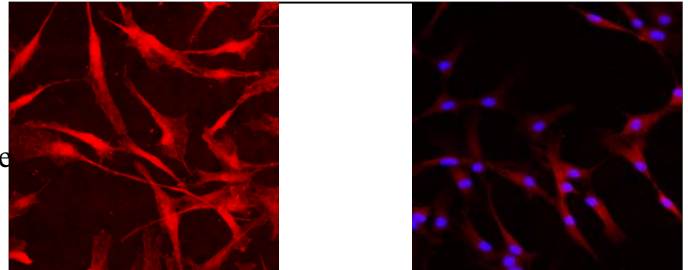


## *Key Objectives*

Our goal is to understand the cellular and molecular basis of pathologies that affect the skeleton.

## *Major Research Interests*

Osteoclast differentiation and biology  
The mechanisms of bone loss in cancers of bone  
Gene expression in osteoarthritic bone  
Osteoblast/osteoclast signalling  
Anti-tumour agents



Above: Human osteoblasts growing on the metal tantalum  
Left Panel: Cells stained with Phalloidin  
Right Panel: Cells stained with DAPI  
It was found that the forms of Ta used in Orthopaedics are biocompatible for human osteoblasts

## *Summary*

The Bone Cell Biology Laboratory of the Department of Orthopaedics and Trauma seeks to find answers to problems encountered in clinical orthopaedics by studying the basic biology of bone in health and disease.

Questions include:

What causes osteoarthritis?

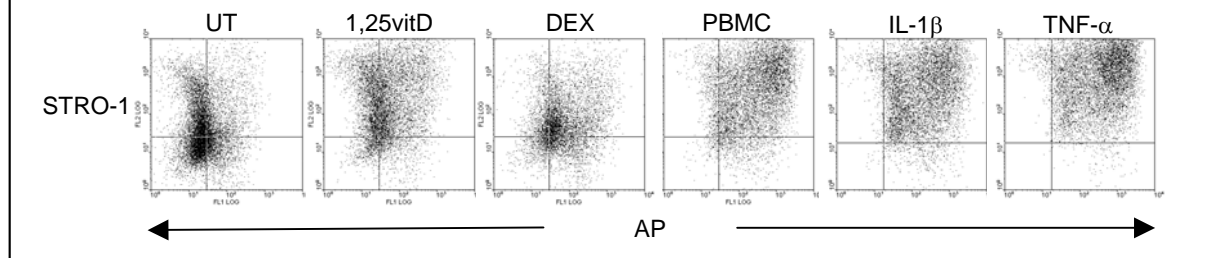
What causes the loss of bone around orthopaedic prostheses, leading to their eventual failure?

Why do cancers in bone cause loss of bone and how can these cancers be treated?

Since our understanding of the factors that control human bone turnover is still incomplete, it is essential for us to obtain a better basic understanding of the biology of the cell types that are responsible for bone formation (osteoblasts) and bone removal (osteoclasts). We are therefore studying the formation and activity of human osteoclasts and the factors that regulate these processes.

Although much of this work is performed by growing cells artificially in culture, we consider it very important to investigate how the results obtained match with events within the human bone itself, and we have designed experiments to address this question. This work has yielded very exciting data, which we believe will shed light on the aetiology of osteoarthritis. We are also investigating new ways to kill cancer cells, focusing largely on cancers of bone. This involves study of a new molecule called TRAIL, and how it partners with other molecules to cause death of cancer cells, with little attendant toxicity to normal cells.

Human osteoblasts treated with various agents that influence bone and analysed by Fluorescence Activated Cell Sorting (FACS).



Note: For more information on the staff, projects & publications of the Orthopaedic Cell Biology Laboratory –

link to: [http://www.hansoninstitute.sa.gov.au/rbj\\_ortho.htm](http://www.hansoninstitute.sa.gov.au/rbj_ortho.htm)

### *Spinal*

Director of Program

Professor Robert Fraser (right), E-mail: [rdf@adelaide.on.net](mailto:rdf@adelaide.on.net).

Director of Basic Research

Dr Robert Moore (Adelaide Centre for Spinal Research)  
E-mail: [rob.moore@imvs.sa.gov.au](mailto:rob.moore@imvs.sa.gov.au).

Location

Spinal Unit, Bice Building, RAH.  
Adelaide Centre for Spinal Research, Level 1, IMVS.

Staff

Mr Christopher Cain, Mr David Hall, Mr Andrew Fagan, Mr George Potter, Spinal Fellows(2), Spinal Resident.



### ***Key Objectives***

To acquire a better clinical, biomechanical and pathological understanding on the spine in health and disease and apply this information in the development of better treatment methods.

### ***Major Research Interests***

Intervertebral disc degeneration  
Biomechanical studies of spine in health and disease  
Outcomes of spinal surgery  
Diagnostic studies of spinal injury and disease

### ***Summary***

Spinal surgery involves the treatment of trauma and work related injuries, as well as correction of pathological or age related changes in joint function. Research has focussed on discitis, disc innervation, spinal injuries, basic research on annular tears and intervertebral disc degeneration and regeneration, disc prolapse, biomechanical studies on intervertebral motion in health and disease and clinical studies on the efficacy of various spinal procedures. In 2000, the Department's spinal research program progressed further with the establishment of the Adelaide Centre for Spinal Research, located in the IMVS. This initiative, funded by a 1.2 million-dollar grant from DePuy AcroMed, also received financial support from the State Government. This has allowed Dr Robert Moore, Head of the Centre and Professor Fraser, Chairman of the Board to significantly expand the clinical and *in vivo* investigations into the aetiology, clinical and pathological features and outcomes of treatment of different congenital and trauma induced back problems.

Laboratory and *in vivo* studies being undertaken on the pathoanatomy, biology and biomechanics of the spine represent a large component of the Spinal Research Program. These include studies of the pathomechanics of lower back pain, changes in the structure and biomechanical properties of the annulus fibrosis in the human intervertebral disc during aging and studies modelling degeneration and injury of the lumbar disc. The spinal research group has also assessed spinal implants, bone allograft and graft substitutes for spinal surgery.

### ***Upper Limb***

Director of Program

Mr Michael Sandow, e-mail:  
michael.sandow@adelaide.edu.au

Location

Upper Limb Unit, Bice Building, RAH.



### ***Key Objectives***

To examine the pathoanatomy, diagnosis and treatment options for upper limb disorders.

### ***Major Research Interests***

Diagnostic techniques for evaluation of upper limb disorders

Shoulder arthroplasty

Pathoanatomy and biomechanics of upper limb disease and trauma related injuries

Improved imaging and virtual surgery options using conventional scanned data.



Left: 3 Dimensional Model of Wrist.

**To see wrist in motion, please go to:  
[www.madacademy.com.au/tla](http://www.madacademy.com.au/tla).**

### ***Summary***

The efficacy and outcomes of many of the newer surgical and rehabilitation techniques used to restore upper limb instability due to sporting or trauma related injuries or joint degeneration have rarely been compared in a controlled setting to conventional forms of treatment or non-operative management. It is therefore important to undertake prospective outcome studies to evaluate these techniques. The outcomes evaluation documentation program for upper limb patients has been fundamental to the success of these clinical studies.

The Service has evidence to support the use of shoulder stabilisation techniques as well techniques of fusion and grafting in the wrist. The issue of hemi versus total shoulder replacement remains contentious but evidence to support the primary total shoulder replacement has been identified and the Department is currently participating in a Cochrane Collaboration with other centres to look at the outcomes on an International basis. The other major project within the Department is the creation of Three Dimensional Imaging Techniques with conventional scanned data. This replaces the original image within a platform accessible to the surgeon to better understand the normal and abnormal pathology, perform virtual surgery and template arthroplasty or corrective bony procedures. The Service remains active in outcome assessments in a whole range of upper limb reconstructive procedures with an emphasis on design and commercial resources for diagnostic tools for detecting upper limb disorders and the monitoring of treatment as well as instruments for upper limb and microsurgery.

The Research Program also has an emphasis on the design, development and commercial release of both diagnostic tools for detecting upper limb disorders and for monitoring treatment, and instrumentation for upper limb and micro-surgery.

## ***Trauma***

Director of Program

Mr Tony Pohl, E-mail: [tpohl@mail.rah.sa.gov.au](mailto:tpohl@mail.rah.sa.gov.au)  
Oksana Holubowycz, Epidemiologist.

Location

Trauma Unit, Bice Building, RAH.  
Orthopaedic Outcomes Unit, North Wing R3.



Staff:

Oksana Holubowycz, Sue Pannach, Trauma  
Fellows, Mellick Chehade.

### ***Key Objectives***

To acquire a better understanding of the outcomes of treatment of fractures and trauma and to apply that knowledge to develop improved treatment methods.

### ***Major Research Interests***

Epidemiology of trauma

Pelvic and acetabular fracture

Clinical and cost outcomes of surgical management of both upper limb, pelvic and lower limb fractures

Fracture healing

The Department is the major tertiary referral centre for trauma in South Australia and the Northern Territory. The Department is also committed to a research program in trauma, with a strong emphasis on outcomes of treatment.

Prospective follow-up protocols have been established for monitoring the outcomes of patients with pelvic and acetabular fractures treated by open reduction and internal fixation. A comprehensive database on pelvic and acetabular fractures incorporates demographic details, injury, treatment and outcomes.

The Trauma Unit runs the Adelaide arm of an international randomised clinical trial examining the performance of the bone-forming molecule, BMP, in the healing of open tibial fractures.

The Department is closely associated with the surrogate skeleton project being conducted by the Defence Science and Technology Organisation (DSTO) investigating the traumatic impact of defence weaponry on human bones and ways of minimising this.

## *Nursing Outcomes*

Director of Program

Ms Leonnie Lambert

E-mail: llambert@mail.rah.sa.gov.au.

Location

Bice Building, RAH.

Staff

Project Nurse: Lorraine Buttler, lbutler@mail.rah.sa.gov.au.



## *Major Interests*

Cost-effectiveness of current and new nursing care initiatives

Patient education

Patient satisfaction with care

Predischarge functional assessment

## *Summary*

The Nursing Unit is committed to the ongoing evaluation of their impact on patient care in terms of cost, patient health outcomes and patient satisfaction.

Collaboration between medical and nursing staff in the development of standardised treatment protocols and critical care nursing pathways has resulted in significant reductions in LOS and outliers. This Department was one of the first Orthopaedic and Trauma Centres in Australia to develop and implement these protocols and pathways and has consequently provided support for other national and international centres in developing similar systems.

The nursing Unit have developed extensive pre-admission, inpatient and discharge education and rehabilitation programs with the aim of achieving improved patient satisfaction and health outcomes through greater patient awareness. Nursing examines other processes for containing the inpatient costs of orthopaedic and trauma patients and improving post-operative rehabilitation. Because of the high joint replacement activity in this institution, Nursing has a dedicated Joint Replacement Nurse position and a Joint Replacement Outcomes Coordinator. Apart from the clinical care and education responsibilities the nurses are responsible for the ongoing evaluation of joint replacement nursing activity, outcomes and cost-effectiveness.

For further information, please search: Joanna Briggs Institute on the Royal Adelaide Hospital Intranet.

## **The Hanson Institute**

The Hanson Institute enhances the research efforts within the Royal Adelaide Hospital, IMVS and the Adelaide University and forms the focus for cancer and other biomedical research in South Australia. Quality medical oncology, cell biology, molecular biology and gene therapy research is undertaken in this institution. The Department of Orthopaedics and Trauma has its Bone Cell Laboratory in this Institution and collaborates closely in its studies on stromal cell lineage, cancer and molecular biology. The Department of Orthopaedics and Trauma has numerous collaborative research programs, and in particular undertakes research with investigators in the Department of Pathology, Adelaide University and the Divisions of haematology and Tissue Pathology, IMVS.

There are state of the art animal operating facilities and accompanying veterinary support, both within the IMVS and at the Institute's field station, which offers both short-term and long-term animal holding facilities. The Department utilises these animal services in its large and small animal research programs.

## **Dept of Orthopaedics and Trauma, University of Adelaide, The Queen Elizabeth Hospital & Health Service**

The Department of Orthopaedics and Trauma has continued research in Joint replacement in the areas of the outcome of prosthetic replacement following displaced femoral neck fracture in young patients, the effect of surgical approach on quadriceps function following total knee arthroplasty, a model for prediction of satisfaction in patients following total knee arthroplasty and outcome trials between the NexGen fixed bearing total knee replacement and the MBK mobile bearing total knee replacement, the Spectron and the Exeter total hip replacements and the TRAC PS mobile bearing total knee replacement and the establishment of an arthroplasty outcomes database. Knee replacements using the new Navigation method have recently been commenced.

In the area of oncologic research, the Department has been undertaking research in the functional results and health outcome of treating giant cell tumour, the natural history of enchondromas and the results of cement augmentation in the surgical management of enchondromas, intramuscular lipomas, hip replacement for metastatic disease, the results of the treatment of the anaemia of metastatic bone disease, the results of treating metastatic disease with the Russell-Taylor humeral nail, the presentation of a second primary in bone after visceral carcinoma, the results of radio-frequency ablation of osteoid osteomas and a comparative trial of neo-adjuvant chemotherapy versus neo-adjuvant radiotherapy for soft tissue sarcoma.

In the area of spinal disease, the Department has been undertaking research in the identification of risk factors for prolonged disability following whiplash, the effects of litigation on recovery following surgery for symptomatic lumbar prolapse, a prospective assessment of the use of autologous growth factors and coralline hydroxyapatite in spinal surgery and a retrospective evaluation of the use of Adcon-L gel in decompressive lumbar spine surgery.

Collaborative work has been undertaken in the areas of differential expression of alternatively spliced variants of the MDM2 oncogene product in bone tumours and sensitisation of cancer and sarcoma cells to TRAIL-induced apoptosis with chemotherapy.

## **Modbury Public Hospital**

The principles of Orthopaedic practice at Modbury Hospital have been good teaching, good research and good community service with no compromise of any one of those three by the others.

This obviously puts us in conflict in regard to resources but we have maintained this stance. Our teaching commitment has remained with the focus of the training of the Orthopaedic registrar with support for our Research Fellow whom is also shared with the RAH. This is an upper limb fellowship area managed by Greg Bain.

We also maintain a commitment to teaching at a lesser level to our two service registrars – basely the apprenticeship method.

The 2 interns have a job specification and are taught by the apprenticeship method but also have a number of key activities that they need to achieve during their 6 week rotation with us.

They present on a subject of their choice in that time frame at the weekly Ward Round on Wednesday.

We have had a number of medical students rotating on the SCAP Programme.

My research has been in the area of the blood supply to the posterior crutiate Ligament, the patella entry feature which has been sent for publication and has been accepted but not yet published. The shoulder post technique for massive rotator cuff tears is in the process of being resubmitted for publication.