WEST AUSTRALIAN SLEEP DISORDERS RESEARCH INSTITUTE (INC.)

SUMMARY OF RESEARCH ACTIVITY

July 1 2008 – June 30 2009

Level 5, G Block
Queen Elizabeth II Medical Centre
Hospital Avenue
Nedlands
Western Australia 6009
Australia
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PROF DAVID HILLMAN  UPPER AIRWAY RESPIRATORY MUSCLES  PROF PETER EASTWOOD

Research Personnel
Dr Jason Kirkness  Postdoctoral Research Fellow (-Feb 2009)
Dr Kelly Shepherd  Postdoctoral Research Fellow (Feb 2009-)
Dr Jennifer Walsh  Postdoctoral Research Fellow
Ms Vanessa Baker  Research Assistant (Jul 2008-)
Ms Kathleen Maddison  Research Assistant
Ms Bernadett Szegner  Research Assistant
Ms Kelly Shepherd  PhD Candidate (-Feb 2009)
Ms Laila Simpson  PhD Candidate
Ms Kate Smith  PhD Candidate
Ms Sian Turner  PhD Candidate
Dr Jonathan Williamson  PhD Candidate
Ms Catherine Hillman  4th Year Medical Student Research Project
Mr Evan Heinecke  4th Year Medical Student Research Project
Mr Justin Hii  4th Year Medical Student Research Project
Ms Ashleigh Becu  Honours Candidate
Mr Joshua Goldman  Honours Candidate

Fields of Work
1. Sleep-Disordered Breathing
   • Upper airway function during anaesthesia and sleep
   • Computational dynamics of the human upper airway
   • Upper and lower airway imaging using endoscopic optical coherence tomography
   • Upper and lower oesophageal sphincter function during wakefulness and sleep
   • Non-invasive detection of gastric insufflation
   • Intramuscular recording of genioglossus myoelectric activity
   • The relationship between sleep apnoea, vascular function and erectile dysfunction
   • The relationship between travel, sleep quality and elite athletic performance
   • Continuous positive airway pressure (CPAP) usage adherence
2. Chronic Lung Disease
   • The role of respiratory muscle training in chronic lung disease
   • Measuring functional capacity in chronic lung disease
   • Defining the burden of disease and benefits of exercise in moderate to severe asthma

Techniques
1. Oesophageal impedance
2. Oesophageal manometry
3. Oesophageal pH monitoring
4. Administration of non-invasive ventilation
5. Polysomnography
6. Optical coherence tomography
7. Intramuscular electrodes
8. Neuro-stimulators
9. Respiratory muscle training
10. Portable metabolic gas analyser
11. Cycle ergometry
12. Treadmill ergometry
13. Dual energy X-ray absorptiometry (DEXA)
14. Questionnaires

Collaborations

Local
A/Prof G Allison Centre for Musculoskeletal Studies, The University of Western Australia
Dr D Chambers Lung Transplant Unit, Royal Perth Hospital
Prof E Gabbay Lung Transplant Unit, Royal Perth Hospital
Dr E Giles Anaesthetics, Sir Charles Gairdner Hospital
Mr G Hee Ear, Nose and Throat surgeon, Sir Charles Gairdner Hospital
Prof J Hamdorf Medical Education, Faculty of Medicine, Dentistry and Health Sciences, University of Western Australia
A/Prof S Jenkins Department of Physiotherapy, Sir Charles Gairdner Hospital; School of Physiotherapy, Curtin University
Dr S Mukherjee West Australian Sleep Disorders Research Institute, Queen Elizabeth II Medical Centre
Winthrop Prof L Palmer Centre for Genetic Epidemiology and Biostatistics, The University of Western Australia
A/Prof J Pan Department of Mechanical Engineering, The University of Western Australia
Dr M Phillips Department of Respiratory Medicine, Sir Charles Gairdner Hospital
Dr P Platt Department of Anaesthetics, Sir Charles Gairdner Hospital
Dr T Russel Department of Anaesthetics, Sir Charles Gairdner Hospital
Prof D Sampson Department of Electronic and Electrical Engineering, The University of Western Australia
Winthrop Prof PJ Thompson Lung Institute of Western Australia, Queen Elizabeth II Medical Centre

National
Dr T Amis Department of Respiratory Medicine, Westmead Hospital, NSW
Dr R Grunstein Sleep Disorders Centre, Royal Prince Alfred Hospital, NSW
Prof R Holloway Department of Gastroenterology Hepatology, Royal Adelaide Hospital, SA
Dr D McEvoy Department of Respiratory Medicine, Repatriation Hospital, SA
A/Prof J Wheatley Department of Respiratory Medicine, Westmead Hospital, NSW

International
Mr R Brandmeier MAP Medizin-Technologie GmbH, Martinsreid, Germany
A/Prof A Schwartz Johns Hopkins Sleep Disorders Centre, Johns Hopkins Medical School, Baltimore, Maryland, USA
A/Prof H Schneider Johns Hopkins Sleep Disorders Centre, Johns Hopkins Medical School, Baltimore, Maryland, USA. 

WASDRI Annual Report: Jul 2008 - Jun 2009
## Grants

<table>
<thead>
<tr>
<th>Year</th>
<th>Principle Invest.</th>
<th>Funding Body: Project Title</th>
<th>$ Awarded</th>
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<tbody>
<tr>
<td>2005-2008</td>
<td>Kirkness, JP</td>
<td><em>NHMRC (513716) CJ Martin Fellowship</em></td>
<td>$301 462</td>
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<tr>
<td></td>
<td></td>
<td>Neurohumoral and neuromuscular control of upper airway patency in obesity and sleep apnoea</td>
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<td>2006-2008</td>
<td>Eastwood, PR</td>
<td><em>NHMRC (403953)</em></td>
<td>$467 750</td>
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<tr>
<td>Sampson, DD</td>
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<td>Mechanisms of pharyngeal collapse in obstructive sleep apnoea defined by optical coherence tomography</td>
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<td>Hillman, DR</td>
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<tr>
<td>2008</td>
<td>Williamson, J</td>
<td><em>Sir Charles Gairdner Hospital Research Foundation</em></td>
<td>$9 980</td>
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<tr>
<td>Eastwood, PR</td>
<td></td>
<td>Using optical imaging to investigate and manage disorders of the low airway</td>
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<td>2008</td>
<td>Williamson, J</td>
<td><em>Sir Charles Gairdner Hospital Research Foundation (PhD top-up scholarship)</em></td>
<td>$5 000</td>
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<tr>
<td>Eastwood, PR</td>
<td></td>
<td>Applications of anatomical optical coherence tomography in lower airways of human</td>
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<td>2008</td>
<td>Eastwood, PR</td>
<td><em>Medical and Health Infrastructure Fund (WA)</em> Department of Health, Government of Western Australia Infrastructure Grant - Round 11</td>
<td>$37 778</td>
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<td>2008-2010</td>
<td>Eastwood, PR</td>
<td><em>NHMRC (513854)</em></td>
<td>$395 125</td>
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<tr>
<td>Hillman, DR</td>
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<td>Bronchoscopic applications of anatomical optical coherence tomography</td>
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<td>Sampson, DD</td>
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<td>Phillips, M</td>
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<td>2008-2012</td>
<td>Eastwood, PR</td>
<td><em>NHMRC (513705)</em></td>
<td>$595 000</td>
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<td></td>
<td>Senior Research Fellowship</td>
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<td>2009</td>
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<td><em>Medical and Health Infrastructure Fund (WA)</em> Department of Health, Government of Western Australia Infrastructure Grant - Round 12</td>
<td>$22 487</td>
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<td>2009</td>
<td>Jenkins, SC</td>
<td><em>Sir Charles Gairdner Hospital Research Fund</em></td>
<td>$45 931</td>
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<tr>
<td>Cecins, N</td>
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<td>Do wheeled walkers increase physical activity in people with chronic obstructive pulmonary disease?</td>
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<td>Hill, K</td>
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<td>2009-2011</td>
<td>Eastwood, PR</td>
<td><em>NHMRC (572647)</em></td>
<td>$451 250</td>
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<tr>
<td>Hillman, DR</td>
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<td>Collapsibility of the human upper airway – relationships between sleep sedation and anaesthesia and head posture</td>
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<td>Walsh, J</td>
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<td>Kirkness, J</td>
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<tr>
<td>2009-2011</td>
<td>Allison, JA</td>
<td><em>NHMRC (570814)</em></td>
<td>$421 500</td>
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<tr>
<td>Jenkins, SC</td>
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<td>Optimising outcomes for chronic obstructive pulmonary disease (COPD): Evaluation of walking training</td>
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<tr>
<td>Eastwood, PR</td>
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<td>Jenkins, CR</td>
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<td>Hillman, DR</td>
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<td>McKeogh, ZJ</td>
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</tbody>
</table>

## Presentations and Invited Lectures

### Local


Award: The UWA School of Pathology and Laboratory Medicine Award


National


3. Walsh JH. ‘Posture and OSA: It’s not just about supine vs. lateral.’ Upper Airway Symposium, Thredbo, ACT. February 2009


5. Hillman DR. ‘OSA: is it all the same?’ Upper Airway Symposium, Thredbo, ACT. February 2009.

**International**


**Publications**


**Book Chapter**


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**DR STEWART CULLEN  SLEEP APNOEA**

**Fields of Work**

1. Predictors of sleep apnoea using questionnaires and laser measurements of oral dimensions

2. Treatment of sleep apnoea:
   - Mandibular advancement splints: new models
   - Tongue retaining devices
   - Positional therapy: new appliances

3. Validation of the radical pulse oximeter in the detection of sleep apnoea

4. Sleep studies in the Busselton Health Survey

**Techniques**

1. Lasers

2. Radical oximeters

3. Mandibular advancement splints and tongue retaining devices

**Collaborations**

**Local**

A/Prof A James  Department of Pulmonary Physiology/West Australian Sleep Disorders Research Institute, Queen Elizabeth II Medical Centre

Dr N McArdle  Sleep Disorders Clinic, Queen Elizabeth II Medical Centre

Mr W Noffsinger  Department of Pulmonary Physiology/West Australian Sleep Disorders Research Institute, Queen Elizabeth II Medical Centre

Dr S Phung  Sleep Disorders Clinic, Queen Elizabeth II Medical Centre

**Presentations and Invited Lectures**

**Local**

ASSOC PROF ALAN JAMES  
AIRWAY REMODELING / INFLAMMATION, 
EPIDEMIOLOGY

Research Personnel
Dr Mark Carroll  
Research Officer (April 2009-)
Mr John Elliot  
Research Officer
Ms Peta Grayson  
Research Officer (part-time)
Ms Robyn Jones  
Research Assistant (-April 2009)
Mr Mark Carroll  
PhD Candidate (-Apr 2009)
Dr Jonathon Williamson  
PhD Candidate (- Dec 2009)
Ms Robyn Jones  
PhD Candidate (April 2009-)

Fields of Work

1. Airway Remodeling
   • Hypertrophy and hyperplasia of airway smooth muscle (ASM) in asthma
     - Stereological measurement of ASM and extracellular matrix (ECM)
     - Validation of methods – serial section and validation
     - Relation of changes in ASM and ECM to age and duration and severity of asthma
   • Comparison of airway remodeling (smooth muscle, extracellular matrix, reticular basement membrane) in biopsies and airway transverse sections.
   • Assessment of deep inspiration on in vitro and in vivo lung function, and its relation to airway structure

2. Airway Inflammation
   • Validation study of biopsy to assess airway remodeling and inflammation
   • Mast cells in fatal asthma

3. Population Studies
   • Burden of obstructive lung disease (BOLD)
     - Multi-centre national study that involves a random sample of the Busselton adult population
   • Busselton Health Survey 2005-2007
     - Random sample of the Busselton population (adults and children)
     - Analysis: correlates of asthma; cluster analyses of asthma phenotypes
   • Collaborative (The Netherlands; Italy; Hungary) study of bronchodilator response of forced oscillatory technique (FOT)
     - Predicted values for FOT
   • Indigenous Health
     - Working Party on Aboriginal Respiratory Health
   • Epidemiology of obstructive sleep apnoea (Busselton and WA Sleep Health Study)

4. Genetic influences on airway disease and allergy
   • Single nucleotide polymorphisms
     - Collaborative studies with Canadian (AllerGen) and European (GABRIEL; DeCODE; Spirometa) consortia to achieve large genome wide associations.
   • HLA-DR polymorphisms and asthma/allergy

5. Clinical Trials
   • AMAZES: randomised placebo-controlled trial of azithromycin in the treatment of asthma
Techniques
1. Morphometry and stereology
2. Immunohistochemistry
3. Physiology - airway responsiveness; forced oscillation technique
4. Exhaled nitric oxide
5. Atopy
6. Induced sputum
7. Population surveys and epidemiology

Collaborations

Local
Prof A Baddeley School of Mathematics, University of Western Australia
Dr K Finucane Department of Pulmonary Physiology, Sir Charles Gairdner Hospital
Dr G Hall Institute for Child Health Research
Dr D Hillman Department of Pulmonary Physiology, Sir Charles Gairdner Hospital
Dr A Kicic Institute for Child Health Research
Dr P McFawn Department of Physiology, University of Western Australia
Dr G Maguire WA Department of Health (Broome)
Prof H Mitchell Department of Physiology, University of Western Australia
Prof AW Musk Department of Respiratory Medicine, Sir Charles Gairdner Hospital
Dr P Noble Department of Physiology, University of Western Australia
Mr W Noffsinger Department of Pulmonary Physiology, Sir Charles Gairdner Hospital
Prof L Palmer Centre for Genetic Epidemiology and Biostatistics, The University of Western Australia
Prof P Sly Telethon Institute for Child Health Research
A/Prof S Stick Telethon Institute for Child Health Research
Dr D Turner Telethon Institute for Child Health Research
Dr S Young ProHealth Training.

National
A/Prof M Abramson Department of Epidemiology and Preventive Medicine, Monash Medical School, Alfred Hospital, VIC
Dr G King Woolcock Institute of Medical Research, University of Sydney, NSW
A/Prof R Kumar School of Pathology, University of New South Wales, NSW
Dr K MacKay Department of Respiratory Medicine, Children’s Chest Research Centre, Children’s Hospital at Westmead, NSW
A/Prof G Marks Woolcock Institute of Medical Research, NSW
A/Prof P Robinson Department of Thoracic Medicine, Royal Children’s Hospital, VIC
Dr B Toelle Woolcock Institute of Medical Research, NSW
Prof J Upham Princess Alexandra Hospital, QLD
Prof H Walters School of Medicine, University of Tasmania, TAS
Dr R Wood-Baker Respiratory Medicine, University of Tasmania, TAS

International
Prof T Bai MacDonald Research Laboratory, St Paul’s Hospital, Vancouver, Canada
Prof M Bonsignore Instituto di Fisopatologia, Palermo, Italy
Prof W Cookson Imperial College London, England
Dr M Dohlnikof Department of Pathology, Sao Paulo University Medical School, Brazil
Dr F Green Faculty of Medicine, University of Calgary, Canada
Dr Z Hantos University of Szeged, Szeged, Hungary
Prof J Hogg  
James Hogg  
iCAPTURE Centre, University of British Columbia, 
Vancouver, Canada

Dr D Knight  
James Hogg  
iCAPTURE Centre, University of British Columbia, 
Vancouver, Canada

Dr T Mauad  
Department of Pathology, Sao Paulo University Medical School, 
Brazil

Dr E Oostveen  
University Hospital, Antwerp, Belgium

Prof P Pare  
MacDonald Research Laboratory, St Paul’s Hospital, Vancouver, 
Canada

Prof E Spindel  
Oregon Regional Primate Research Centre, Oregon, USA

Grants

<table>
<thead>
<tr>
<th>Year</th>
<th>Principle Invest.</th>
<th>Funding Body: Project Title</th>
<th>$ Awarded</th>
</tr>
</thead>
</table>
| 2007-2009  | James, AL Carroll, NG | NHMRC (446800)  
Assessment of airway smooth muscle hypertrophy in asthma and chronic obstructive pulmonary disease (COPD) | $286 325    |
| 2007-2009  | Marks, G Abrams, M James, AL Maguire, G Toelle, B Wood-Baker, R | NHMRC (457385)  
Burden of obstructive lung disease in Australia                                            | $737 788    |
|            |                   |                                                                                             | $122 835 (WA) |
| 2008-2010  | McFawn, P Noble, P James, A Mitchell, H | NHMRC (513842)  
Response of human airways to deep inflation in health and disease                          | $270 000    |
| 2008       | James, AL         | Sir Charles Gairdner Hospital Research Foundation (0804)  
Airway smooth muscle in non-eosinophilic asthma                                             | $10 000     |
| 2008       | James, A Elliot, J | Hollywood Private Hospital Research Foundation (RF034)  
Airway smooth muscle in non-eosinophilic asthma                                             | $10 000     |
| 2008       | James, A          | Medical Health Research and Infrastructure Fund  
Department of Health, Government of Western Australia  
Infrastructure Grant - Round 12                                                           | $18 369     |
| 2009       | James, A          | Hollywood Private Hospital Research Foundation  
Does sampling the large airways tell you about the small airways in asthma?                | $20 000     |
| 2009       | James, A          | Asthma Foundation of WA  
Non-eosinophilic asthma                                                                       | $45 000     |
| 2009       | James, A          | Sir Charles Gairdner Hospital  
The use of bronchial biopsies to assess remodeling of airway smooth muscle                | $62 979     |
| 2009       | James, A          | Sir Charles Gairdner Hospital Research Foundation  
Does sampling the large airways tell you about the small airways in asthma?                | $20 000     |

Presentations and Invited Lectures

Local
2. James A. Invited speaker: ‘Asthma management. Asthma Foundation presentation to 


National

International


**Publications**


Fields of Work

1. Sleep apnoea and vascular disease
2. Treatment of sleep apnoea
3. Diagnostic strategies for sleep apnoea
4. Sleep Apnea and cardioVascular Endpoints (SAVE) Study
   - Multi-centre, randomised, controlled trial to determine the effects of nasal continuous positive airway pressure (CPAP) in preventing cardiovascular disease in high risk patients with moderate-severe OSA
5. Predicting Use of Continuous positive airway pressure in Obstructive Sleep Apnoea (PUCOSA study)
   - Prospective, longitudinal cohort study of carefully characterized sleep clinic patients with effective measurement of potential predictors of adherence (e.g. self-efficacy, illness representations, mood, and OSA severity).

Collaborations

Local
Prof L Beilin Royal Perth Hospital
Dr K Gain Royal Perth Hospital
Dr S Mukherjee West Australian Sleep Disorders Research Institute
Prof L Palmer Centre for Genetic Epidemiology and Biostatistics, The University of Western Australia
Dr S Phung West Australian Sleep Disorders Research Institute
Prof G Watts Royal Perth Hospital

Presentations and Invited Lectures

Local

National
1. McArdle, N. Chair: ‘Insomnia and Sleep Health SIG Symposium (CPAP adherence). Australasian Sleep Association Annual Scientific Meeting, Adelaide, SA.
Research Personnel
Ms Jessica Lee Study Coordinator
Mr Greg Love Research Assistant (part-time)
Ms Bernadett Szegner Study Coordinator
Ms Cass Edwards PhD Candidate
Ms Annette Fedson PhD Candidate
Ms Laila Simpson PhD Candidate
Ms Kim Ward PhD Candidate
Dr John Tan Cardiology Registrar
Ms Archana Aran 4th Year Medical Student Research Project
Mr Jian Yang Chong 4th Year Medical Student Research Project
Mr Chin Loon Chua 4th Year Medical Student Research Project
Ms Radhika Ellies 4th Year Medical Student Research Project
Ms Amelea Fang 4th Year Medical Student Research Project
Ms Lauren Gibson 4th Year Medical Student Research Project
Ms Natalie Koroznikova 4th Year Medical Student Research Project
Ms Emma Lancaster 4th Year Medical Student Research Project
Mr Sam McTigue 4th Year Medical Student Research Project
Ms Elena Mamaeva 4th Year Medical Student Research Project
Mr Simon Papaelias 4th Year Medical Student Research Project
Mr Kavinda Senasinghe 4th Year Medical Student Research Project
Ms Priya Siva 4th Year Medical Student Research Project
Mr Benedict Tan 4th Year Medical Student Research Project
Mr Derek Teh 4th Year Medical Student Research Project
Ms Joelin Teh 4th Year Medical Student Research Project
Ms Sheyva Tiwari 4th Year Medical Student Research Project
Mr Kent Hodgson Health Science Practicum Student
Ms Sarah McMichael Health Science Practicum Student

Fields of Work
1. WA Sleep Health Study (WASHS)
   - Epidemiology and genetic epidemiology of obstructive sleep apnoea (OSA)
2. Epidemiology of obstructive sleep apnoea
   - Inter-relationship of OSA with cardiovascular disease and depression
3. Busselon Healthy Ageing Study (BHAS)
   - Causes and risk factors for a wide range of conditions of public health importance in an ageing population:
     - respiratory disease
     - cardiovascular disease
     - sleep disorders.
4. Sleep Apnea and Cardiovascular Endpoints (SAVE) Study
   - Multi-centre, randomised, controlled trial to determine the effects of nasal continuous positive airway pressure (CPAP) in preventing cardiovascular disease in high risk patients with moderate-severe OSA
5. Genetic epidemiology
   - Biologically plausible candidate genes for OSA susceptibility, severity and response to therapy in WASHS participants and in the Busselton Health Study
   - International Sleep Genetics Consortium (ISGC)

Techniques
1. Population surveys
2. Questionnaires and other self-report instruments
3. Blood biochemistry
4. Blood biospecimen – DNA, plasma and serum
5. Polysomnography
6. Genotyping
7. Home sleep study devices
8. Dual Energy X-Ray Absorptiometry (DEXA)
9. Anthropometric measurements
10. Carotid Intima-Media Thickness (CIMT) ultrasound
11. Assessment of mental health outcomes in sleep patients

Collaborations

Local
Prof O Almeida School of Psychiatry and Clinical Neurosciences, The University of Western Australia
Dr D Blacker Department of Neurology, Sir Charles Gairdner Hospital
Prof N de Klerk Department of Biostatistics, Telethon Institute for Child Health Research
Prof P Eastwood West Australian Sleep Disorders Research Institute
Prof G Hankey Department of Neurology, Royal Perth Hospital
Prof J Hung Department of Cardiology, Sir Charles Gairdner Hospital
A/Prof A James West Australian Sleep Disorders Research Institute
Dr J Kirkness West Australian Sleep Disorders Research Institute
Clin Prof AW Musk Department of Respiratory Medicine, Sir Charles Gairdner Hospital
Dr S Shetty Department of Cardiology, Royal Perth Hospital

National
Prof R Grunstein Woolcock Institute of Medical Research in Sydney
Prof D McEvoy Adelaide Institute for Sleep Health
Prof G Marks Woolcock Institute of Medical Research
A/Prof N Rogers Brain & Mind Research Institute, University of Sydney

International
Prof D Christiani Harvard School of Public Health, USA
Dr A Malhotra Harvard Medical School, USA
Prof A Pack University of Pennsylvania Medical School
### Grants

<table>
<thead>
<tr>
<th>Year</th>
<th>Principle Invest.</th>
<th>Funding Body: Project Title</th>
<th>$ Awarded</th>
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<tbody>
<tr>
<td>2004-2009</td>
<td>Palmer, LJ, Holman, D, Stanley, F, de Klerk, N, Zeps, N, van Bockxmeer, F, Semmens, J, Smith, M</td>
<td><strong>NHMRC Enabling Grant (Special Facilities)</strong>&lt;br&gt;<strong>(303312)</strong>&lt;br&gt;A national population-based genetic epidemiology, biospecimen and bioinformatic resource</td>
<td>$2 900 000</td>
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<td>15% allocated to sleep research</td>
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<td>2005-2009</td>
<td>Grunstein, R, McEvoy, D, Palmer, LJ, Marks, G, Pierce, R, Rogers R</td>
<td><strong>NHMRC Enabling Grant (Clinical Trials)</strong>&lt;br&gt;<strong>(343020)</strong>&lt;br&gt;Australian Sleep Health Clinical Trials Network.</td>
<td>$1 040 000</td>
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<td>10% allocated to sleep research</td>
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<td>2006-2010</td>
<td>Palmer, L, Beilby, J, van Bockxmeer, F, Zeps, N, Semmens, J, Stanley, F, Klinken, P, Constable, I, Christiansen, F</td>
<td><strong>NHMRC Enabling Grant (Special Facilities)</strong>&lt;br&gt;<strong>(404116)</strong>&lt;br&gt;The Western Australian DNA Bank</td>
<td>$1 375 000</td>
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<tr>
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<td>15% allocated to sleep research</td>
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<td>2008</td>
<td>Mukherjee, S</td>
<td><strong>Hollywood Private Hospital Research Foundation</strong>&lt;br&gt;The Western Australian Sleep Health Study</td>
<td>$20 000</td>
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<td>2008</td>
<td>Mukherjee, S</td>
<td><strong>Sir Charles Gairdner Hospital Research Foundation</strong>&lt;br&gt;The Western Australian Sleep Health Study</td>
<td>$20 000</td>
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### Presentations and Invited Lectures

#### Local

#### International


**Publications**


**Book Chapter**

DR BHAJAN SINGH
DR BILL FINUCANE

DIAPHRAGM CONTROL OF BREATHING

Research Personnel

Fields of Work

1. Neuro-mechanical efficiency of the diaphragm
2. Respiratory failure and the chemical control of breathing in chronic obstructive lung disease
3. Lung volume reduction surgery in emphysema
4. Atrial fibrillation and obstructive sleep apnoea
5. The effect of positive end-expiratory pressure

Techniques

1. Measurement of diaphragm displacement by radiography, fluoroscopy and ultrasound;
2. Measurement of diaphragm electromyography;
3. Transthoracic pneumonostomy.

Collaborations

Local

Dr Martin Phillips Department of Respiratory Medicine, Sir Charles Gairdner Hospital
Dr Pradyot Saklani Department of Cardiology, Sir Charles Gairdner Hospital
Dr Adrian Regli Intensive Care Unit, Sir Charles Gairdner Hospital
Dr Vernon van Heerden Intensive Care Unit, Sir Charles Gairdner Hospital
### SUMMARY OF RESEARCH ACTIVITIES: 2008 - 2009

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of research staff</strong></td>
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<tr>
<td>Full-time</td>
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<td>Part-time</td>
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<td><strong>Total</strong></td>
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<tr>
<td><strong>Number of students</strong></td>
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<tr>
<td>Honours</td>
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<td>4th Medical Students</td>
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<td><strong>Total</strong></td>
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<tr>
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<td><strong>Number of presentations</strong></td>
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<td>Local</td>
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<td>International</td>
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<td><strong>Total</strong></td>
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<td><strong>Grants awarded to WASDRI Researchers:</strong></td>
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<td>Total of all current grants</td>
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<td>Total for 2008/2009</td>
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