



Sir Charles
Gairdner Hospital



WEST AUSTRALIAN SLEEP DISORDERS RESEARCH INSTITUTE (INC.)

SUMMARY OF RESEARCH ACTIVITY

July 1 2007 – June 30 2008

Level 5, G Block
Queen Elizabeth II Medical Centre
Hospital Avenue
Nedlands
Western Australia 6009
Australia

Table of Contents

PROF DAVID HILLMAN UPPER AIRWAY RESPIRATORY MUSCLES	3
ASSOC PROF PETER EASTWOOD	3
Fields of Work.....	3
Grants	3
Research Personnel.....	4
Collaborations	4
Techniques	5
Presentations and Invited Lectures.....	5
Publications	7
DR STEWART CULLEN SLEEP APNOEA.....	8
Fields of Work.....	8
Collaborations	8
Techniques	8
Publications	8
ASSOC PROF ALAN JAMES AIRWAY REMODELING AND INFLAMMATION	9
Fields of Work.....	9
Grants	10
Research Personnel.....	10
Collaborations	11
Techniques	12
Presentations and Invited Lectures.....	12
Publications	13
DR NIGEL MCARDLE SLEEP APNOEA.....	13
Fields of Work.....	13
Collaborations	13
Presentations and Invited Lectures.....	14
DR SUTAPA MUKHERJEE EPIDEMIOLOGY	14
Fields of Work.....	14
Grants	14
Research Personnel.....	14
Presentations and Invited Lectures.....	15
DR BHAJAN SINGH DIAPHRAGM CONTROL OF BREATHING	15
DR BILL FINUCANE	15
Fields of Work.....	15
Grants	16
Research Personnel.....	16
Collaborations	16
Techniques	16
Presentations and Invited Lectures.....	16
DR JASON KIRKENS UPPER AIRWAY PATENCY DURING SLEEP.....	17
Fields of Work.....	17
Grants	17
Research Personnel.....	17
Collaborations	17
Techniques	18
Presentations and Invited Lectures.....	18
Publications	19
SUMMARY OF RESEARCH ACTIVITIES	20

PROF DAVID HILLMAN UPPER AIRWAY RESPIRATORY MUSCLES
ASSOC PROF PETER EASTWOOD

Fields of Work

1. Sleep-Disordered Breathing
 - Upper airway function during anaesthesia and sleep
 - Computational dynamics of the human upper airway
 - Upper 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
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

Grants

Year	Principle Invest.	Funding Body; Project Title	\$ Awarded
2004-2008	PR Eastwood	<i>NHMRC (294404) R Douglas Wright Biomedical Career Development Award</i>	\$417 500
2005-2007	AD Lucey PR Eastwood DR Hillman DD Sampson T Balint	<i>Australian Research Council (DP0559408)</i> Modeling and methods of flow-obstruction dynamics in the human upper airway	\$425 000
2005-2008	JP Kirkness	<i>NHMRC (513716) CJ Martin Fellowship</i> Neurohumoral and neuromuscular control of upper airway patency in obesity and sleep apnoea	\$301 462
2006-2008	PR Eastwood DD Sampson DR Hillman	<i>NHMRC (403953)</i> Mechanisms of pharyngeal collapse in obstructive sleep apnoea defined by optical coherence tomography	\$467 750
2007	PR Eastwood	<i>Medical and Health Research Infrastructure Fund (WA)</i> Department of Health, Government of Western Australia Infrastructure Grant - Round 10	\$31 147
2007	JH Walsh P Platt	<i>Sir Charles Gairdner Hospital Research Foundation</i> The efficacy of head posture modifications in the treatment of obstructive sleep apnoea	\$10 000
2007	K Shepherd PR Eastwood	<i>Sir Charles Gairdner Hospital Research Foundation</i> Mechanisms underlying gastroesophageal reflux in obstructive sleep apnoea	\$10 000
2007	KF Smith DR Hillman	<i>Sir Charles Gairdner Hospital Research Foundation</i> The effect of arm support during exercise in subjects with chronic obstructive pulmonary disease (COPD)	\$10 000
2008	J Williamson PR Eastwood	<i>Sir Charles Gairdner Hospital Research Foundation</i> Using optical imaging to investigate and manage disorders of the low airway	\$9 980

2008	J Williamson PR Eastwood	<i>Sir Charles Gairdner Hospital Research Foundation (PhD top-up scholarship)</i> Applications of anatomical optical coherence tomography in lower airways of human	\$5 000
2008	PR Eastwood	<i>Medical and Health Infrastructure Fund (WA)</i> Department of Health, Government of Western Australia Infrastructure Grant - Round 11	\$37 778
2008-2010	PR Eastwood DR Hillman DD Sampson M Phillips	<i>NHMRC (513854)</i> Bronchoscopic applications of anatomical optical coherence tomography	\$395 125
2008-2012	PR Eastwood	<i>NHMRC (513705)</i> Senior Research Fellowship	\$595 000

Research Personnel

Dr Jason Kirkness	Postdoctoral Research Fellow
Dr Jennifer Walsh	Postdoctoral Research Fellow
Ms Tanja Kuzich	Research Assistant
Ms Kathleen Maddison	Research Assistant
Mr Liam Coffey	Research Assistant (part-time)
Ms Kate Godde	Research Assistant (part-time)
Ms Laila Robertson	PhD Candidate
Ms Kelly Shepherd	PhD Candidate
Ms Kate Smith	PhD Candidate
Ms Sian Turner	PhD Candidate
Dr Jonathan Williamson	PhD Candidate
Ms Jane Potter	Honours Candidate
Mr Michael Woods	Honours Candidate

Collaborations

Local

A/Prof G Allison	Centre for Musculoskeletal Studies, University of Western Australia
A/Prof S Jenkins	Department of Physiotherapy, Sir Charles Gairdner Hospital; School of Physiotherapy, Curtin University
A/Prof J Pan	Department of Mechanical Engineering, University of Western Australia
Dr P Platt	Department of Anaesthetics, SCGH
Dr S Mukherjee	West Australian Sleep Disorders Research Institute
Prof D Sampson	Department of Electronic and Electrical Engineering, University of Western Australia
Prof PJ Thompson	Asthma and Allergy Research Institute, Queen Elizabeth II Medical Centre
Prof J Hamdorf	Medical Education, Faculty of Medicine, Dentistry and Health Sciences, University of Western Australia
Prof L Palmer	Centre for Genetic Epidemiology and Biostatistics, The University of Western Australia
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

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. Respiratory muscle training
9. Portable metabolic gas analyser
10. Cycle ergometry
11. Treadmill ergometry
12. Dual energy X-ray absorptiometry (DEXA)

Presentations and Invited Lectures

Local

1. Williamson J. Bronchoscopic imaging using optical coherence tomography - validation and Clinical Applications. Australian Society for Medical Research (WA Branch), Research Week, Curtin University. June 2008.
2. Shepherd K. Occurrence of gastroesophageal reflux symptoms in a sleep clinic population. Australian Society for Medical Research (WA Branch), Research Week, Curtin University. June 2008.
3. Shepherd K. Occurrence of gastroesophageal reflux symptoms in a sleep clinic population. Sir Charles Gairdner Hospital Young Investigator Awards. November 2007.
4. Turner S, Hill K, Eastwood P, Cook A, Thompson P, Jenkins S. Fixed airway obstruction asthma and COPD: Differences in resting lung function and functional exercise capacity. Thoracic Society of Australia and New Zealand Annual Scientific Meeting (WA Branch), The Vines. October 2007.
5. Jenkins S, Cecins N, Camarri B, Williams C, Thompson P, Eastwood P. Published reference equations underestimate 6-minute walk distance for middle-aged and elderly Australians. Thoracic Society of Australia and New Zealand Annual Scientific Meeting (WA Branch), The Vines. October 2007.

National

1. Kirkness JP, Walsh JH, Hillman DR, Platt PR, Maddison KM, Kuzich T, Eastwood PR. Validation of novel methodology for measuring upper airway collapsibility. *Respirology* 2007; 12(Suppl 4): A136.
2. Walsh JH. Upper airway dynamics: awake and asleep. Upper Airway Symposium, Lorne, VIC. February 2008.

3. Eastwood PR. Session Chair. Thoracic Physiology Special Interest Group. Thoracic Society of Australia and New Zealand Annual Scientific Meeting, Melbourne VIC. March 2008.
4. Jenkins S, Eastwood P, Hill K, Cecins N. Influence of disability on changes in 6 minute walk distance following a familiarisation test and training. *Respirology* 2008, 13 (Suppl 2): A50.
5. Jenkins S, Cecins N, Camarri B, Williams C, Thompson P, Eastwood P. Published reference equations underestimate 6 minute walk distance for middle-aged and elderly Australians. *Respirology* 2008, 13 (Suppl 2): A49.
6. Williamson J, Armstrong J, Becker S, Sampson D, Kirkness J, Walsh J, Phillips M, Hillman D, Eastwood P. Anatomical Optical Coherence Tomography provides accurate calibre measurements in phantom airways. *Respirology* 2008, 13 (Suppl 2): A58.
7. Turner S, Eastwood P, Cook A, Thompson P, Jenkins S. Exercise training improves quality of life in middle-aged and older adults with moderate to severe asthma. *Respirology* 2008, 13 (Suppl 2): A39.
8. Turner S, Hill K, Eastwood P, Cook A, Thompson P, Jenkins S. Fixed airway obstruction asthma and COPD: Differences in functional exercise capacity and lung function. *Respirology* 2008, 13 (Suppl 2): A39.
9. Kirkness JP, Eastwood PR, Walsh JH, Maddison KM, Platt PP, Hillman DR, Schwartz AR. Decreasing lung volume promotes collapse of the hypotonic upper airway. *Respirology* 2008, 13 (Suppl 2): A58.

International

1. Hillman D, Walsh J, Maddison K, Platt P, Kirkness J, Eastwood P. The effect of conscious state change on upper airway collapsibility. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A86.
2. Maddison K, Walsh J, Platt P, Kirkness J, Schwartz, Hillman D, Eastwood P. Increasing lung volume as a method to reverse inspiratory flow limitation in anesthetised human. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A134.
3. Shepherd K, Hillman D, Eastwood P. Occurrence of gastroesophageal reflux symptoms in a sleep clinic population. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A109.
4. Shepherd K, Chamber D, Gabbay E, Hillman D, Eastwood P. Nocturnal gastroesophageal reflux and sleep-disorder breathing after lung transplant. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A179.
5. Walsh J, Leigh M, Paduch A, Armstrong J, Maddison K, Sampson D, Hillman D, Eastwood P. Effect of body posture on velopharyngeal shape and size in obstructive sleep apnoea. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A132.
6. Williamson J, Jankelson D, Krishanan A, Malouf M, Glanville AR. Regional airway properties measured with anatomical optical coherence tomography in pig bronchi. *Respirology* 2007; 12 (Supp 4): A124.
7. Eastwood PR. Pathophysiology of obstructive sleep apnoea. Sleep and breathing symposium. 5th World Congress of the World Federation of Sleep Research and Sleep Medicine Societies. Cairns, QLD. September 2007.
8. Walsh JH, Leigh MS, Paduch A, Armstrong JJ, Maddison KJ, Sampson DD, Hillman DR & Eastwood PR. Effect of body posture on velopharyngeal shape and size in obstructive

- sleep apnoea. Poster Presentation. International Sleep & Breathing Meeting, Palm Cove, QLD. September 2007.
9. Eastwood PR. Advances in upper airway structure. 12th Congress of The Asia Pacific Society of Respiriology, Gold Coast, QLD. December 2007.
 10. Eastwood PR. Session Chair. Workshop: 'Advances in upper airway structure'; Oral Session: 'Respiratory structure and function'. 12th Congress of The Asia Pacific Society of Respiriology. Gold Coast, QLD, Australia. December 2007.
 11. Hill K, Jenkins S, Philippe D, Cecins N, Hillman D, Eastwood P. Estimating maximum work rate during incremental cycle ergometry testing from six-minute walk distance in chronic obstructive pulmonary disease. Canadian Physiotherapy Association Annual Congress. Ottawa, Canada. May 2008
 12. Kirkness JP, Eastwood PR, Walsh JH, Maddison KM, Platt PP, Hillman DR, Schwartz AR. Decreasing lung volume promotes collapse of the hypotonic upper airway. *Am J Respir Crit Care Med* 2008; 177 (Abstracts issue): A25.
 13. Williamson J. Bronchoscopic imaging using optical coherence tomography - validation and clinical applications. 48th Annual Meeting of the Japanese Respiratory Society, Kobe, Japan. June 2008.

Publications

1. Hill K, Jenkins SC, Philippe DL, Shepherd KL, Hillman DR, Eastwood PR. Comparison of incremental and constant load tests of inspiratory muscle endurance in COPD. *Eur Respir J* 2007; Sep;30(3):479-86.
2. Hillman DR, Platt PR, Eastwood PR. Invited review. Sleep, anesthesia and the upper airway. *J Crit Care* 2007; 26: 65-72.
3. Panegyres PK, Hillman D, Dunne JW. Laryngeal dystonia causing upper airway obstruction in progressive supranuclear palsy. *J Clin Neurosci* 2007 14(4): 380-381.
4. Walsh JH, Leigh MS, Paduch A, Maddison KJ, Philippe DL, Armstrong JJ, Sampson DD, Hillman DR, Eastwood PR. Evaluation of pharyngeal shape and size using anatomical optical coherence tomography in individuals with and without OSA. *J Sleep Res* 2008; 17; 230-238.
 ** Editorialised: Pillar G, Lavie P. Upper airway obstruction in obstructive sleep apnea – controversies continue. *J Sleep Res* 2008; 17: 123-124.
5. Leigh MS, Armstrong JJ, Paduch A, Walsh JH, Hillman DR, Eastwood PR, Sampson DD. Anatomical optical coherence tomography for long-term, portable, quantitative endoscopy. *IEEE Transactions on Biomedical Engineering* 2008; 55: 1438-1446.
6. Armstrong JJ, Becker S, McLaughlin RA, Leigh MS, Walsh JH, Hillman DR, Eastwood PR, Sampson DD. Anatomical optical coherence tomography – a safe and effective tool for quantitative long-term monitoring of upper airway size and shape. In: Photonic Therapeutics and Diagnostics IV. Editors Kollias, Choi, Zeng, Malek, Wong, Ilgner, Gregory, Tearney, Hirschberg, Madsen. *Proc. of SPIE* 2008; 6842: 68421N (16 pages).
7. Hill K, Jenkins SC, Philippe DL, Cecins C, Hillman DR, Eastwood PR. Estimating maximum work rate during incremental cycle ergometry testing from six-minute walk distance in patients with chronic obstructive pulmonary disease. *Arch Physical Med Rehab*. In press, accepted 18 Jan 2008.
8. Armstrong JJ, Leigh MS, Walsh JH, Hillman DR, Eastwood PR, Sampson DD. Anatomical optical coherence tomography of the human upper airway. In: Optical coherence tomography technology and application. Editors: Fujimoto JG, Drexler W. In press, accepted April 2008.

9. Shepherd KL, DC Chambers, E Gabbay, DR Hillman, PR Eastwood. Obstructive sleep apnoea and nocturnal gastroesophageal reflux are common in lung transplant patients. *Respirology*. In press, accepted 19 May 2008.
10. Walsh JH, Leigh MS, Paduch A, Maddison KJ, Armstrong JJ, Sampson DD, Hillman DR, Eastwood PR. Effect of body posture on pharyngeal shape and size in adults with and without obstructive sleep apnea. *Sleep*. In Press, accepted 28 June 2008.
11. Walsh JH, Maddison KJ, Platt PR, Hillman DR, Eastwood PR. Influence of head extension, flexion and rotation on collapsibility of the passive upper airway. *Sleep*. In Press, accepted 28 June 2008.

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

Collaborations

Local

A/Prof A James	Department of Pulmonary Physiology, West Australian Sleep Disorders Research Institute
Dr N McArdle	Department of Pulmonary Physiology, West Australian Sleep Disorders Research Institute
Mr W Noffsinger	Department of Pulmonary Physiology, West Australian Sleep Disorders Research Institute
Dr S Phung	Department of Pulmonary Physiology, West Australian Sleep Disorders Research Institute

Techniques

1. Lasers
2. Radical oximeters
3. Mandibular advancement splints and tongue retaining devices

Publications

1. Marshall NS, Wong KK, Liu PY, Cullen SR, Grunstein RR. Sleep apnoea as an independent risk factor for all-cause mortality: The Busselton Health Study. *Sleep* 2008; 31(8): 1079-85.

Fields of Work

1. Airway Remodeling
 - Hypertrophy and hyperplasia of airway smooth muscle in asthma
 - Stereological measurement of airway smooth muscle and extracellular matrix in asthma
 - Validation of methods – section orientation and image analysis
 - Relation of changes in airway smooth muscle and extracellular matrix to age and duration and severity of asthma
 - Comparison of airway remodeling (smooth muscle, extracellular matrix, reticular basement membrane) in biopsies and transverse sections of airways in control nonfatal and fatal asthma cases.
2. Airway Inflammation
 - Validation study of biopsy to assess airway and lung inflammation
 - Inflammation in allergen-sensitised and exposed mice
 - Mast cells in fatal asthma
3. Population Studies
 - Burden of obstructive lung disease (BOLD)
 - Multi-centre national study
 - Random sample of current Busselton adult population: questionnaires, forced oscillatory technique, exhaled nitric oxide, spirometry, allergy skin tests
 - Busselton Health Survey 2005-2007
 - Random sample of the Busselton population (adults and children)
 - Questionnaires; morphometry; blood pressure; spirometry; exhaled nitric oxide; forced oscillation technique; airway responsiveness to methacholine; allergy prick skin tests; collection of blood for full blood counts, stored serum and DNA analysis
 - Collaborative (The Netherlands; Italy; Hungary) study of bronchodilator response of forced oscillatory technique
 - Age and gender stratified
 - Sample of Busselton Survey (1994) attendees
 - Indigenous Health
 - Working Party on Aboriginal Respiratory Health
 - Epidemiology of obstructive sleep apnoea (WA SHS)
 - WASDRI Sleep database and genetics study
 - Busselton Health Survey: re-survey of current population
4. Genetic influences on airway disease and allergy
 - Single nucleotide polymorphisms
 - Collaborative studies with Canadian (AllerGen) and European (GARBRUEL; DeCODE) consortia to achieve large genome wide associations.
 - Genome screen
 - HLA-DR polymorphisms and asthma/allergy
5. SIDS
 - Influence of parental smoking on airway structure and inflammation.
 - Ethical issues in seeking parental consent.
6. Clinical Trials

Grants

Year	Principle Invest.	Funding Body; Project Title	\$ Awarded
2003-2007	James, AL	<i>NHMRC (26100)</i> Practitioner Fellowship	\$325 000
2005-2007	James, AL Carroll, NC	<i>NHMRC (343601)</i> Hyperplasia and hypertrophy of airway smooth muscle in asthma	\$281 000
2005-2007	Musk, AW James, AL Beilby, JP Palmer, LJ Knuiman, MW	<i>NHMRC (353532)</i> The changing prevalence of asthma and chronic obstructive disease in Australia	\$729 380
2007-2009	James, AL Carroll, NG	<i>NHMRC (446800)</i> Assessment of airway smooth muscle hypertrophy in asthma and chronic obstructive pulmonary disease (COPD)	\$286 325
2007-2009	Marks, G Abramson, M James, AL Maguire, G Toelle, B Wood-Baker, R	<i>NHMRC (457385)</i> Burden of obstructive lung disease in Australia	\$737 788 \$122 835 (WA)
2007	Carroll, N James, AL	<i>Asthma Foundation of WA</i> Can endobronchial biopsy be used as a tool to evaluate airway smooth muscle (ASM) remodeling in patients with asthma?	\$45 346
2007	James, AL	<i>Sir Charles Gairdner Hospital Research Foundation (0707)</i> Assessment of extracellular matrix deposition and smooth muscle hypertrophy in asthma and COPD	\$10 000
2007	James, AL	<i>Medical and Health Research Infrastructure Fund (WA)</i> Department of Health, Government of Western Australia Infrastructure Grant - Round 11	\$13 894
2008	McFawn, P Noble, P James, A Mitchell, H	<i>NHMRC (513842)</i> Response of human airways to deep inflation in health and disease	\$270 000
2008	James, AL	<i>Sir Charles Gairdner Hospital Research Foundation (0804)</i> Airway smooth muscle in non-eosinophilic asthma	\$10 000
2008	James, A Elliot, J	<i>Hollywood Private Hospital Research Foundation (RF034)</i> Airway smooth muscle in non-eosinophilic asthma	\$10 000

Research Personnel

Mr John Elliot	Research Officer
Ms Peta Maxwell	Research Officer (part-time)
Ms Robyn Jones	Research Assistant
Mr Mark Carroll	PhD candidate
Dr Andreas Fiene	Respiratory Trainee

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	Institute for Child Health Research
A/Prof S Stick	Institute for Child Health Research
Dr D Turner	Institute for Child Health Research
Dr S Young	Department of Pulmonary Physiology, Sir Charles Gairdner Hospital

National

A/Prof M Abramson	Department of Epidemiology and Preventive Medicine, Monash Medical School, Alfred Hospital, Victoria
Dr G King	Woolcock Institute of Medical Research, University of Sydney, New South Wales
A/Prof R Kumar	School of Pathology, University of New South Wales
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, New South Wales
A/Prof P Robinson	Department of Thoracic Medicine, Royal Children's Hospital, Victoria
Dr B Toelle	Woolcock Institute of Medical Research, New South Wales
Prof J Upham	Princess Alexandra Hospital, Queensland
Prof H Walters	School of Medicine, University of Tasmania
Dr R Wood-Baker	Respiratory Medicine, University of Tasmania

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 Dohnikof	Department of Pathology, Sao Paulo University Medical School, Brazil
Dr F Green	Faculty of Medicine, University of Calgary, Canada
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
Prof P Pare	MacDonald Research Laboratory, St Paul's Hospital, Vancouver, Canada
Prof E Spindel	Oregon Regional Primate Research Centre, Oregon, USA

Dr E Oostveen
Dr Z Hantos

University Hospital, Antwerp, Belgium
University of Szeged, Szeged, Hungary

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

Presentations and Invited Lectures

Local

1. James A. 'Asthma drugs'. UWA (3rd year) medical students. August 2007.
2. James A. Invited speaker: 'The role of smooth muscle in excessive airway narrowing'. Lung Institute of Western Australia. April 2008.
3. James A. 'NIV – hypoventilation and respiratory failure'. SCGH Nurses. June 2008.
4. Musk AW, Knuiman M, Hunter M, Hui J, Divitini ML, Inglis E, Whittall D, Maxwell P, James AL. Prevalence rates of smoking in asthmatics in Busselton since 1966: The 2005-2007 Busselton Health Survey. Thoracic Society of Australia and New Zealand Annual Scientific Meeting (WA Branch), The Vines. October 2007.

National

1. Elliot J, Jones R, Mauad T, Dolhnikoff M, Abramson M, McKay K, Bai T, Green F, James A. Airway smooth muscle cell volume is unchanged in asthma. *Respirology* 2008; 13(2): A29.
2. Fiene A, Elliot J, Jones R, Carroll M, Green F, James A. Assessment of airway remodeling using bronchial biopsies. *Respirology* 2008; 13(2): A16.
3. James A, Knuiman M, Hunter M, Hui J, Whittall D, Divitini M, Inglis E, Musk A. The prevalence of asthma in adults and children: The Busselton 2005-7 Survey. *Respirology* 2008; 13(2): A37.
4. Carroll M, Carroll N, Baddeley A, Gundersen HJG, James A. Mast cell densities in endobronchial biopsies and in small airways are related. *Respirology* 2008; 13(2): A28.
5. Carroll M, Carroll N, Baddeley A, Gundersen HJG, James A. Mast cell densities in endobronchial biopsies and in the whole lung are not related. *Respirology* 2008; 13(2): A28.
6. Musk AW, Knuiman M, Hunter H, Hui J, Divitini ML, Inglis E, Whittall D, Maxwell P, James AL. Prevalence rates of smoking in asthmatics in Busselton since 1966: The 2005-2007 Busselton Health Survey. *Respirology* 2008; 13(2): A23.
7. J Hui, M Divitini, AW Musk, AL James, M Hunter, DE Whittall, E Inglis, M Knuiman. The prevalence of COPD in adults: The Busselton 2005-7 Survey. *Respirology* 2008; 13(2): A10.

International

1. Elliot J, Jones R, Mauad T, Dolhnikoff M, Abramson M, McKay K, Bai T, Green F, James A. Airway smooth muscle cell volume is unchanged in asthma. *Am J Respir Crit Care Med* 2008; 177 (Abstracts issue): A326.
2. Fiene A, Elliot J, Jones R, Carroll M, Green F, James A. Assessment of airway remodeling using bronchial biopsies. *Am J Respir Crit Care Med* 2008; 177 (Abstracts

issue): A496.

3. James A, Knuiman M, Hunter M, Hui J, Whittall D, Divitini M, Inglis E, Musk A. The prevalence of asthma in adults and children: The Busselton 2005-7 Survey. *Am J Respir Crit Care Med* 2008; 177 (Abstracts issue): A673.
4. Siena L, Pace E, Elliot J, Gjomarkaj M, Saetta M, Bonsignore MR, James A. Reduced apoptosis of CD8+ T-lymphocytes in the airways of mild COPD patients. *Am J Respir Crit Care Med* 2008; 177 (Abstracts issue): A874.

Publications

1. Hales BJ, Laing IA, Pearce LJ, Hazell LA, Mills KL, Chua KY, Thornton RB, Richmond P, Musk AW, James AL, le Souëf PN, Thomas WR. Distinctive IgE anti-house dust allergen-binding specificities in a tropical Australian Aboriginal Community. *Clin Exp Allergy* 2007;37:1357-63.
2. James A. History of asthma in Western Australia. Jenny Gregory and Jan Gothard (eds), *Historical Encyclopedia of Western Australia*, University of Western Australia Press, Crawley, 2008: [In press].
3. Musk AW, James AL, Palmer LJ, Ryan GF, Lake F, Golledge CL, de Klerk NH. Respiratory infections and lung function in an Australian Aboriginal community. *Respirology* 2008; 13: 257-262.
4. Elliot JG, Ford DL, Beard JF, Fitzgerald KN, Robinson PJ, James AL. Informed consent for the study of retained tissues from post-mortem examination following sudden infant death. *J Med Ethics* January 2008; 34: 742-746.
5. Hui J, Oka A, James A, Palmer LJ, Musk AW, Beilby J, Inoko H. A genome-wide association scan for asthma in a general Australian population. *Hum Genet* January 2008 123(3): 297-306.
6. James AL, Green FH, Abramson MA, Bai TR, Dolhnikoff M, Mauad T, McKay KO, Elliot JG. Airway basement membrane perimeter distensibility and airway smooth muscle area in asthma. *J Appl Physiol* March 2008; 104: 1703-1708.
7. Araujo B, Dolhnikoff M, Silva L, Elliot J, Lindeman J, Ferreira D, Mulder A, Gomes H, Fernezlian S, James A, Mauad T. Extracellular matrix components and regulators within the airway. *Eur Resp J* March 2008 [In press].

DR NIGEL MCARDLE

SLEEP APNOEA

Fields of Work

1. Sleep apnoea and vascular disease
2. Treatment of sleep apnoea
3. Diagnostic strategies for sleep apnoea

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
Prof G Watts

West Australian Sleep Disorders Research Institute
Royal Perth Hospital

Presentations and Invited Lectures

Local

1. McArdle N. Clinical Update – Sleep Medicine” Royal Perth Hospital Medical Grand Round, Perth. March 2008.
2. McArdle N, Singh B, Gain K, Murphy M, McGuire C, Mutch S, Hillman D. Home and Laboratory autotitration are at least as effective as manual titration in determining Continuous Positive Airway Pressure (CPAP) for moderate-severe Obstructive Sleep Apnoea/hypopnoea Syndrome (OSAHS). 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): P503.

DR SUTAPA MUKHERJEE

EPIDEMIOLOGY

Fields of Work

1. Establishment of the WA Sleep Disorders Cohort, a population-based resource, to investigate the epidemiology of obstructive sleep apnoea in WA;
2. Occupational exposures and health effects- with particular interest in asbestos and diesel exposure;
3. Malignant mesothelioma.

Grants

Year	Principle Invest.	Funding Body; Project Title	\$ Awarded
2007	S Mukherjee	<i>Hollywood Private Hospital Research Foundation</i> Establishment of a population-based database for sleep apnoea	\$10 000
2007	S Mukherjee	<i>Sir Charles Gairdner Hospital Research Foundation</i> Establishment of a population-based database for sleep apnoea	\$10 000
	S Mukherjee D Hillman C de Chaneet A James	<i>Department of Health, State Health Advisory Council</i> Development of a triage questionnaire for rural sleep apnoea patients	\$154 554

Research Personnel

Ms Jess Lee

Study Coordinator

Mr Greg Love

Research Assistant (part-time)

Ms Annette Fedson

PhD Candidate

Ms Laila Robertson

PhD Candidate

Ms Kim Ward

PhD Candidate

Mr Anand Venkataraman

4th Year Medical Student Collaboration

Local

Dr P Eastwood

West Australian Sleep Disorders Research Institute

Dr J Kirkness

West Australian Sleep Disorders Research Institute

Prof N de Klerk Department of Biostatistics, Telethon Institute for Child Health Research
Clin Prof AW Musk Department of Respiratory Medicine, Sir Charles Gairdner Hospital
Prof L Palmer Centre for Genetic Epidemiology and Biostatistics, The University of Western Australia

International

Prof D Christiani Harvard School of Public Health, USA

Presentations and Invited Lectures

National

1. Kirkness, J, Potter J, Fedson A, Shepherd K, Walsh J, Kuzich T, Mukherjee S, Hillman D, Eastwood P. Regional fat distribution in males and females with obstructive sleep apnoea (OSA). TSANZ (WA) Annual Scientific Meeting, The Vines. October 2007.

International

1. Mukherjee S, Williams C, Love G, Lee J, Hillman D, Palmer L. C-reactive protein (CRP) in obstructive sleep apnoea. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A112.
2. Fedson A, Mukherjee S, Palmer L, Hung J, Lee J, Williams C, Hillman D. The value of questionnaire, anthropometric and biochemical assessment in preliminary work-up of obstructive sleep apnoea. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A111.
3. Ward K, Robertson L, Palmer L, Hillman D, Eastwood P, Lee J, Ward K, Mukherjee S. Lifestyle factors and physical activity in patients attending the Western Australian Disorder Research Institute 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* 2007; 5 (Supp 1): A111.

DR BHAJAN SINGH
DR BILL FINUCANE

DIAPHRAGM CONTROL OF BREATHING

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

Grants

Year	Principle Invest.	Funding Body; Project Title	\$ Awarded
2005-2007	B Singh KE Finucane	<i>Boehringer Ingelheim Pty Ltd</i> <i>Pfizer Pharmaceuticals</i> Lung volume reduction with tiotropium in chronic obstructive pulmonary disease (COPD): Improved dyspnoea: Mechanisms and clinical implications	\$214 000

Research Personnel

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

Techniques

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

Presentations and Invited Lectures

Local

1. Singh B. Respiratory Physiology. FRACP Tutorial, Department of Medicine, Sir Charles Gairdner Hospital. July 2007.
2. Singh B. Monitoring DLCO during bleomycin therapy. Clinical meeting. Department of Respiratory Medicine Sir Charles Gairdner Hospital. July 2007.
3. Singh B. CPAP – a healthy choice for snorers. WA Sleep Disorders Research Institute. August 2007.
4. Singh B. Lung function criteria for selecting patients for lung resection. Clinical Meeting Department of Pulmonary Physiology, Sir Charles Gairdner Hospital. October 2007.
5. Singh B. Therapy Clinic. Clinical meeting. WA Sleep Disorders Research Institute. November 2007.
6. Singh B. Arterial blood gases and case studies. Educational Meeting, Department of Speech Pathology, Sir Charles Gairdner Hospital. June 2008.
7. Regli A, Hockings L, Musk G, Roberts B, Singh B, van Heerden PV. The Impact of positive end-expiratory pressure at different intra-abdominal pressures on functional residual capacity and oxygen delivery in a pig model. Autumn Scientific Meeting 2008 of the WA Section of the Australian Society of Anaesthetists. June 2008

National

1. Regli A, Hockings L, Musk G, Roberts B, Noffsinger B, Singh B, van Heerden PV. The Impact of positive end-expiratory pressure at different intra-abdominal pressures on cardiac output and functional residual capacity in a pig model. Australian Society for Medical Research Scientific Symposium June. 2008.

Fields of Work

1. Upper airway collapsibility during sleep
2. Upper airway surface forces
3. Effect of obesity on upper airway control
4. Novel diagnostic and treatment approaches in obstructive sleep apnoea

Grants

Year	Principle Invest.	Funding Body; Project Title	\$ Awarded
2005-2008	JP Kirkness	<i>NHMRC (513716) CJ Martin Fellowship</i> Neurohumoral and neuromuscular control of upper airway patency in obesity and sleep apnoea	\$301 462
2008-2009	JP Kirkness	<i>Raine Medical Foundation Priming Grant</i> Dynamic modulation of airflow and upper airway properties during polysomnography	\$171 270

Research Personnel

Ms Kate Godde	Sleep Technologist/Part-time Research Assistant (Apr 2008)
Ms Marie-Therese Hunter	Sleep Technologist (June 2008)
Ms Bernadett Szegner	Research Associate (Jun 2008)
Ms Jane Potter	Honours Candidate
Mr Michael Woods	Honours Candidate

Collaborations**Local**

Prof J Hamdorf	Department of Surgery, The University of Western Australia
Mr N McLean	School of Psychology, The University of Western Australia
Dr S Mukherjee	West Australian Sleep Disorders Research Institute
Prof L Palmer	Centre for Genetic Epidemiology and Biostatistics, The University of Western Australia
Ms L Simpson	Centre for Genetic Epidemiology and Biostatistics, The University of Western Australia

National

Dr T Amis	Ludwig Engel Centre for Respiratory Research, Westmead, NSW
Prof P Cistulli	Woolcock Institute, Sydney, NSW
Mrs M Verma	Ludwig Engel Centre for Respiratory Research, Westmead, NSW
A/Prof JR Wheatley	Ludwig Engel Centre for Respiratory Research, Westmead, NSW

International

A/Prof T Ayuse	Nagasaki School of Dentistry, Nagasaki, Japan
Mr M Erlaker	University of Technology Munich, Germany
A/Prof B McGinley	Johns Hopkins Sleep Disorders Centre, Baltimore, USA
A/Prof S Patil	Johns Hopkins Sleep Disorders Centre, Baltimore, USA
A/Prof H Schneider	Johns Hopkins Sleep Disorders Centre, Baltimore, USA
Prof A Schwartz	Johns Hopkins Sleep Disorders Centre, Baltimore, USA
Prof F Smith	Johns Hopkins Sleep Disorders Centre, Baltimore, USA
Dr R Stoohs	Dortmund Sleep Disorders Centre, Dortmund, Germany

Techniques

1. Upper airway critical collapsing pressure
2. Neuromuscular responses to upper airway obstruction
3. Quantitative pneumography utilisation
4. Polysomnography
5. Dual energy X-ray absorptiometry
6. Nasal insufflation

Presentations and Invited Lectures

Local

1. Kirkness, JP, Potter J, Fedson A, Shepherd K, Walsh J, Kuzich T, Mukherjee S, Hillman D, Eastwood P. Regional fat distribution in males and females with obstructive sleep apnoea (OSA). TSANZ (WA) Annual Scientific Meeting, Swan Valley. October 2007.
2. Biomechanics of obesity and upper airway patency in obstructive sleep apnoea. School of Physiology, Faculty of Life and Physical Sciences, The University of Western Australia. September 2007.

National

1. Kirkness JP, Walsh JH, Hillman DR, Platt PR, Maddison KM, Kuzich T, Eastwood PR. Validation of novel methodology for measuring upper airway collapsibility. *Respirology* 2007; 12(Suppl 4): A136.
2. Regional Fat distribution in Obstructive Sleep Apnoea. Australian Upper Airway Symposium, Lorne, VIC. February 2008.
3. Nasal insufflation therapy in obstructive sleep apnoea. Australian Upper Airway Symposium, Lorne, VIC. February 2008.
4. Co-mentor. Sleep and Physiology Special Interest Group. Thoracic Society of Australia and New Zealand Annual Scientific Meeting, Melbourne VIC. March 2008.
5. Kirkness JP. Invited speaker. How to plan your career – academic and research career options. Thoracic Society of Australia and New Zealand Annual Scientific Meeting, Melbourne VIC. March 2008.
6. Kirkness JP, Eastwood PR, Walsh JH, Maddison KM, Platt PP, Hillman DR, Schwartz AR. Decreasing lung volume promotes collapse of the hypotonic upper airway. *Respirology* 2008, 13 (Suppl 2): A58.
7. Williamson J, Armstrong J, Becker S, Sampson D, Kirkness J, Walsh J, Phillips M, Hillman D, Eastwood P. Anatomical optical coherence tomography provides accurate calibre measurements in phantom airways. *Respirology* 2008, 13 (Suppl 2): A58.

International

1. Hillman D, Walsh J, Maddison K, Platt P, Kirkness J, Eastwood P. The effect of conscious state change on upper airway collapsibility. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* August 2007; 5 (Supp 1): A86.
2. Maddison K, Walsh J, Platt P, Kirkness J, Schwartz, Hillman D, Eastwood P. Increasing lung volume as a method to reverse inspiratory flow limitation in anesthetised human. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia. *Sleep Biol Rhythms* August 2007; 5 (Supp 1): A134.
3. Session Co-Chair. Cranio-facial issues in sleep apnoea. 5th Congress of the World Federation of Sleep Research and Sleep Medicine Societies (WFSRS), Cairns Australia.
4. Session Chair. Respiratory, neurobiology and sleep oral session. 12th Congress of the Asia

Pacific Society and 2nd joint Congress of the American College of Chest Physicians, Gold Coast, QLD, Australia. December 2007.

5. Kirkness JP, Eastwood PR, Walsh JH, Maddison KM, Platt PP, Hillman DR, Schwartz AR. Decreasing lung volume promotes collapse of the hypotonic upper airway. *Am J Respir Crit Care Med* 2008; 177 (Abstracts issue): A25.
6. Kirkness, J. Co-Chair. Mini Symposium: SAS. 48th Meeting of the Japanese Respiratory Society, Kolbe, Japan. June 2008.
7. Kirkness, J. Decreasing lung volume promotes collapse of the hypotonic upper airway. Mini Symposium: SAS. 48th Meeting of the Japanese Respiratory Society, Kolbe, Japan. June 2008.

Publications

1. Kirkness JP; Schwartz AR; Schneider H; Punjabi N; Maly JJ; Laffan AM; McGinley BM; Magnuson T; Schweitzer M; Smith PL; Patil SP. Contribution of male sex, age, and obesity to mechanical instability of the upper airway during sleep. *J Appl Physiol* 2008; 104(6): 1618-1624.
2. McGinley BM, Schwartz AR, Schneider H, Kirkness JP, Smith PL, Patil SP. Upper Airway Neuromuscular Compensation during Sleep is Defective in Obstructive Sleep Apnea. *J Appl Physiol* 2008; 105(1): 197-205.
3. Howitt L, Kairaitis K, Kirkness JP, Garlick SR, Wheatley JR, Byth K & Amis TC. Oscillatory pressure wave transmission from the upper airway to the carotid artery. *J Appl Physiol* 2007; 103(5): 1622-1627.
4. McGinley BM, Patil SP, Kirkness JP, Smith PL, Schwartz AR, & Schneider H. A Nasal cannula can be used to treat obstructive sleep apnea. *Am J Respir Crit Care Med* 2007; 176(2): 194-200.

SUMMARY OF RESEARCH ACTIVITIES

Number of research staff	
Full-time	9
Part-time	5
Total	14
Number of students	
Honours	4
PhD	9
Total	13
Number of publications 2007/08	23
Number of presentations	
Local	13
National	24
International	27
Total	64
Grants awarded to WASDRI Researchers:	
Total of all current grants	\$5 379 346
Total for 2007/2008	\$1 237 760