

WEST AUSTRALIAN SLEEP DISORDERS RESEARCH INSTITUTE (INC.)

Research Program

The strength of the research program continued to increase through 2000 – 2001 with work in three main areas:

Diaphragm function/control of breathing
Upper airway dimensions/respiratory muscles
Airway pathology/respiratory epidemiology

Researchers have been active in expanding collaborations, obtaining ongoing research funding, pursuing and completing current programs of research, presenting data at national and international scientific meetings and achieving a total of 21 publications in peer-reviewed top quality journals in 2000 and 2001. These achievements are itemised below.

WASDRI has developed links with UWA and ICHR and is a centre for the national multicentre AVCAL trial. Members of WASDRI hold positions on Hospital, State and National Research Committees (including NHMRC) and 4 members (David Hillman, Alan James, Neil Carroll, Peter Eastwood) have been invited to take part in symposia at this year's ATS annual scientific meeting in Atlanta, Georgia.

Drs Bhajan Singh and 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.

Grants 2000 - 2001

2000-01	B Singh	Australian Lung Foundation/Boehringer Ingelheim	\$35,000 p.a.
2000	B Singh	Athelstan and Amy Saw Fellowship, UWA	\$10,000
2000	B Singh	NHMRC Postgraduate Research Scholarship	\$24,497
2001	B Singh	Sir Charles Gairdner Hospital Research Foundation	\$12,000
	KE Finucane		
	DR Hillman		
	JA Panizza		
2002	B Singh	Sir Charles Gairdner Hospital Research Foundation	\$10,000
	KE Finucane		
	DR Hillman		

Research Personnel

J Panizza, principle research officer/assistant

Techniques

Ultrasound, radiology, physiological measures of diaphragm displacement. Planimetry of chest X-rays.

Presentations – National

1. Singh B, Panizza JA, Drury PJ, Finucane KE. Repeatability and normalization of diaphragm electromyogram (EMG) and signal strength in healthy subjects. *Respirology* 2000; 5(suppl): O59,A15.
2. Singh B, Panizza J, Finucane KE. Examining the assumptions in a method for measuring the volume displaced by diaphragm motion (ΔV_{di}). *Respirology* 2000; 5(suppl): P195, A69.
3. Douglas JA, Noffsinger WJ, Singh B, Hillman DR. Effect of neck position, mandibular advancement and mouth opening on hypopharyngeal dimensions. *Respirology* 2000; 5(suppl): P176, A64.
4. Singh B, Panizza J, Finucane KE. Breath-by-breath measurement of the volume displaced by diaphragm motion (ΔV_{di}). *Respirology* 2000; 5(suppl): P176, A58.

Publications

1. Singh B, Eastwood PR, Finucane KE. The volume displaced by diaphragm motion in emphysema. *J Appl Physiol* 2001; 91(5): 1913-1923.
2. Eastwood PR, Hillman DR, Finucane KE. Inspiratory muscle performance in endurance athletes and sedentary subjects. *Respirology* 2001; 6: 95-104.

Patent

- 2002 KE Finucane, B Singh. Breath by breath measurement of the volume displaced by the diaphragm. *Patent pending.*

Drs David Hillman and Peter Eastwood- Upper airway, respiratory muscles

Fields of Work

1. Assessment of upper airway dimensions using optical interferometry;
2. Effect of lung volume on upper airway collapsibility;
3. Respiratory muscle training in patients with chronic lung disease;
4. Aerophagia in non-invasive positive pressure ventilation.

Grants 2000-2001

2000	DD Sampson PR Eastwood DR Hillman	Medical Research Fund of Western Australia	\$70,000
2001	PR Eastwood DR Hillman PR Platt	Sir Charles Gairdner Hospital Research Fund	\$12,500
2001	PR Eastwood DD Sampson DR Hillman	Health Group	\$50,842
2000-2002	PR Eastwood DR Hillman	NHMRC (109903)	\$317,324
2002	PR Eastwood DR Hillman	Sir Charles Gairdner Hospital Research Fund	\$10,000
2002-04	PR Eastwood DR Hillman SC Jenkins N Cecins D Green M Phillips	NHMRC (212016)	\$340,000

Research Staff

L Coffey, Research Assistant, RESMED;
M Connard, Research Assistant, RESMED;
C Jensen, Research Assistant, AVCAL trial;
S Katagiri, Visiting Research Fellow, Tokyo, Japan;
K Shepherd, Research Assistant;
G Sturdy, Masters student;
I Szollosi, Research Assistant

Collaborations

Nola Cecins, Department of Physiotherapy, SCGH;
Professor S Jenkins, Department of Physiotherapy, SCGH; Lecturer Physiotherapy, Murdoch University;
Dr M Phillips, Department of Respiratory Medicine, SCGH;
Dr P Platt, Department of Anaesthetics, SCGH;
Professor DD, Sampson, Department of Electronic and Electrical Engineering, UWA.

Techniques

Anaesthetics, needle and surface electrode EMG, oesophageal monitoring, administration of non-invasive ventilation.

Presentations and Invited Lectures - Local

1. Lung Research Group, Sir Charles Gairdner Hospital. Upper airway behaviour during general anaesthesia and sleep (oral). October 2000.
2. Short course in Pulmonary Rehabilitation. Laboratory-based exercise research in sleep apnoea (oral). September 2000.
3. Sleep-disordered Breathing Support Group of Western Australia. Current research in sleep apnoea (oral). October 2000.
4. Thoracic Society of Australia and New Zealand (WA Branch). Symposium on exercise and pulmonary rehabilitation. Exercise prescription in lung disease (oral). April 2001.
5. Thoracic Society of Australia and New Zealand (WA Branch). Winter Scientific Meeting. Famous cases of ethical misconduct (oral). July 2001

Presentations and Invited Lectures - National

1. Hillman DR. 6th World Congress on Sleep Apnoea, Sydney NSW. Upper pressure-flow relationships during general anaesthesia in humans (oral). March 2000.
2. Hillman DR. 6th World Congress on Sleep Apnoea, Sydney NSW. Dental devices to treat snoring and sleep apnoea – practical issues (oral). March 2000.
3. Hillman DR. 6th World Congress on Sleep Apnoea, Sydney NSW. Non-invasive ventilation (oral). March 2000.
4. Hillman DR. 7th International Symposium on Sleep and breathing, Sydney NSW. Sleep Apnoea and Ischaemic Heart Disease. 2000.
5. Hillman DR. Thoracic Society of Australia and New Zealand, Annual Scientific Meeting, Melbourne. Modalities for the diagnosis of sleep disordered breathing. March 2000.
6. Hillman DR. Australasian Sleep Association, Annual Scientific Meeting, Melbourne. Invited lecture: “Should we standardise evaluation of the upper airway?”. 2000.
7. Hillman DR. Malaysian Thoracic Society, Annual Congress, Kuala Lumpur. Invited lecture: Spectrum of sleep-disordered breathing. 2000.
8. Malaysian Thoracic Society, Annual Congress, Kuala Lumpur. Invited lecture: State-of-the-art: management of sleep apnoea. 2000.
9. Western Pacific Association of Critical Care Medicine, 11th Congress, Singapore. Workshop Noninvasive Ventilation. 2000.
10. Thoracic Society of Australia and New Zealand, Annual Scientific Meeting, Brisbane. Non-invasive ventilation in cystic fibrosis. 2001.
11. Eastwood PE, Szollosi I, Platt PR, Hillman DR. Upper airway collapsibility during general anaesthesia predicts severity of sleep apnoea. *Respirology* 2001; 6(suppl): P148, A51.
12. Australasian Sleep Association, Postgraduate Course, Adelaide. Bilevel ventilation in ventilatory failure. 2001.

Presentations – International

1. Lau W-M, Hillman DR. A predictive model for obstructive sleep apnoea. *Am J Respir Crit Care Med* 2000; A354.
2. Eastwood PE, Szollosi I, Platt PR, Hillman DR. Upper airway collapsibility during general anaesthesia predicts severity of sleep apnoea. *Am J Respir Crit Care Med* 2000; A86.

3. Kirkness JP, Eastwood PE, Szollosi I, Platt PR, Wheatley JR, Amis TC, Hillman DR. Reduced surface tension of the upper airway lining liquid promotes upper airway patency in anaesthetised humans. *Am J Respir Crit Care Med* 2000; A834.
4. Eastwood PE, Sturdy GA, Green DJ, Jenkins SC, Cecins M, Hillman DR. High-intensity respiratory muscle training in patients with obstructive pulmonary disease. *Am J Respir Crit Care Med* 2000; A152.

Publications

1. Hukins CA, Hillman DR. Daytime predictors of sleep hypoventilation in Duchenne muscular dystrophy. *Am J Respir Crit Care Med* 161:166-70, 2000.
2. Hukins CA, Mitchell IC, Hillman DR. Radiofrequency tissue volume reduction of the soft palate in simple snoring. *Arch Otolaryngol Head Neck Surg* 126:602-606, 2000.
3. Curran AK, Rodman JR, Eastwood PR, Henderson KS, Dempsey JA, Smith CA. Ventilatory responses to specific CNS hypoxia in sleeping dogs. *J Appl Physiol* 2000; 88: 1840-1852.
4. Eastwood PR, Curran AK, Smith CA, Dempsey JA. Hemodynamic effects of pressures applied to the upper airway during sleep. *J Appl Physiol* 2000; 89: 537-548.
5. Loadsman JA, Hillman DR. Anaesthesia and Sleep Apnoea. *Brit J Anaesth* 86:254-66, 2001.
6. Rogers IR, Inglis S, Speedy D, Hillman D, Noffsinger W, Jacobs I. Changes in respiratory function during a wilderness multisport endurance competition. *Wilderness and Environmental Medicine* 12:13-16, 2001.
7. Sher AE, Flexon PB, Hillman DR et al. Temperature controlled radiofrequency tissue volume reduction surgery in the treatment of snoring. *Otolaryngol Head Neck Surg* 125:312-318, 2001.
8. Satoh M, Eastwood PR, Smith CA, Dempsey JA. Non-chemical elimination of inspiratory motor output via mechanical ventilation in sleep. *Am J Respir Crit Care Med* 2001; 163:1356-1364.
9. Singh B, Eastwood PR, Finucane KE. The volume displaced by diaphragm motion in emphysema. *J Appl Physiol* 2001; 91(5): 1913-1923.
10. Eastwood PR, Finucane KE, Hillman DR. Inspiratory muscle performance in endurance athletes and sedentary subjects. *Respirology* 6:95-104, 2001.

DRS ALAN JAMES AND NEIL CARROLL – AIRWAY REMODELING AND INFLAMMATION

Fields of Work

1. Mechanisms of persistent airway inflammation;
2. Airway remodeling and airway mechanics;
3. Airway immunology and lymphoid aggregates;
4. Epidemiology of respiratory disease;
5. Assessment of airway inflammation;
6. Genetic influences on airway disease and allergy.

Grants 2000 - 2001

1998-2000	James, AL Carroll, NG	NHMRC (981516)	\$291,000
1999-2001	Musk, AW Ryan, G le Souëf, P James, AL	Health Department of Western Australia	\$143,000 p.a.
2000	James, AL Carroll, NG	Asthma Foundation	\$40,000
2000	Carroll, NG James, AL	Sir Charles Gairdner Hospital Research Fund	\$10,000
2000-2002	James, AL de Klerk, NH Kroft, ML Hansen, J	NHMRC (110320)	\$387,349
2001	James, AL Elliot, J	Sir Charles Gairdner Hospital Research Fund	\$10,000
2001	James, AL Elliot, J	Sir Charles Gairdner Hospital Research Fund	\$15,000

Research Staff

M Carroll, Research Assistant;
K Down, Research Assistant;
J Elliot, Research Officer;
J Dromey, Research Assistant;
P Maxwell, Research Officer, Secretary;
S Mutavdzic, Research Assisatnt.

Collaborations – Local

Prof N de Klerk, Institute for Child Health Research;
Dr K (Bill) Finucane, Department of Pulmonary Physiology, Sir Charles Gairdner Hospital;
Dr D Hillman, Department of Pulmonary Physiology, Sir Charles Gairdner Hospital;
Professor P Holt, Institute for Child Health Research;
Dr J Hansen, Institute for Child Health Research;
Dr D Knight, Department of Medicine, University of Western Australia;
A/Professor H Mitchell, Department of Physiology, University of Western Australia;
Clinical Professor AW (Bill) Musk, Department of Respiratory Medicine, Sir Charles Gairdner Hospital;
Professor P Sly, Institute for Child Health Research;
Professor P Thompson, Department of Medicine, University of Western Australia.

Collaborations – National

A/Prof M Abramson, Department of Epidemiology and Preventive Medicine, Monash Medical School, Alfred Hospital;
A/Professor P Robinson, Department of Thoracic Medicine, Royal Children's Hospital;
Professor H Walters, Department of Epidemiology and Preventive Medicine, Monash Medical School, Alfred Hospital;
A/Professor J Wilson, Department of Respiratory Medicine, Alfred Hospital.

Collaborations – International

Professor W (Bill) Cookson, Henry Wellcome Building for Human Genetics, Oxford University, Oxford, England;
Dr Francis Green, Faculty of Medicine, University of Calgary, Canada;
Professor J Hogg, Macdonald Research Laboratory, St Paul's Hospital, Vancouver, Canada;
Professor P Jefferey, Royal Brompton National Heart and Lung Institute, London, England;
Dr D Kaminsky, University of Vermont, USA;
Dr L Palmer, Channing Laboratory, Harvard Medical School, Boston, Massachusetts, USA;
Professor P Pare, Macdonald Research Laboratory, St Paul's Hospital, Vancouver, Canada;
Professor E Spindel, Oregon Regional Primate Research Centre, Oregon, USA;
Professor M Vignola, Istituto di Fisopatologia, Palermo, Italy.

Techniques

Morphometry, immunohistochemistry, airway responsiveness, lung function, atopy testing, induced sputum.

Presentations - Local

1. Elliot J, Carroll N, James A, Robinson P. In-utero cigarette smoke exposure and alveolar attachments in the sudden infant death syndrome. *Respirology* 2000; 5(Suppl): O15, A3.
2. Musk AW, James AL, Ryan GF, Mukherjee S, Waring JA, le Souëf PN, McCarthy J, Wood MM, Johnson D, Palmer LJ, de Klerk NH. Decline in lung function in adult Australians of Aboriginal descent (AAAD). *Respirology* 2000; 5(Suppl): O23, A5.
3. James AL, Pearce-Pinto G, Elliot J, Carroll N. The relationship between sub-basement membrane thickness and airway wall dimensions in asthma. *Respirology* 2000; 5(suppl): P52, A32.
4. Carroll N, Mutavdzic S, Elliot J, Mackay K, James AL. HLA-DR expression on tissue resident cells in asthma and chronic obstructive pulmonary disease. *Respirology* 2000; 5(suppl): O41, A10.
5. Carroll N, Mutavdzic S, Elliot J, McKay K, James AL. Lymphoid aggregates and HLA-DR expression within the airways in asthma and chronic obstructive pulmonary disease. *Respirology* 2000; 5(suppl): P70, A37
6. Carroll N, Mutavdzic S, Elliot J, Mackay K, James A. The relationship between fibroblasts and airway structure in patients with asthma and chronic obstructive pulmonary disease (COPD). *Respirology* 2001; 6:A30.
7. Carroll N, Elliot J, Mutavdzic S, James A, Robinson P. Maternal cigarette smoking and HLA-DR expression in alveolar macrophages in infants. *Respirology* 2001; 6:A46.

8. Elliot J, Carroll N, James A, Robinson P. Maternal cigarette smoking and alveolar wall elastin in the infant lung. *Respirology* 2001; 6:P130.
9. James A, Bowman J, Cookson H, Fritschi L, James C, Knight C, Lewis L, Mutavdzic S, Pearce-Pinto G, Ryan M, Szollosi I, Ton A, Verheijden M, Whittall D, Woods M, Musk AW. Respiratory symptoms, lung function, smoking and allergy in a central Australian Aboriginal community. *Respirology* 2001; 6:A48.
10. James A. Thoracic Society of Australia and New Zealand (WA Branch). Annual Scientific Meeting. Allen and Hanbury's Distinguished Lecturer. 2000.
11. James A. Invited Guest Lecturer. Institute for Child Health Research, University Department of Medicine and Princess Margaret Hospital Department of Respiratory Medicine Annual Combined Meeting (WA). 2001.

Presentations - International

1. James AL, Pearce-Pinto G, Elliot J, Carroll N. The relationship between sub-basement membrane thickness and airway wall dimensions in asthma. *Am J Respir Crit Care Med* 2000; 161(3): A110.
2. Carroll N, Mutavdzic S, Elliot J, MacKay K, James A. HLA-DR expression on tissue resident cells in asthma and chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2000; 161(3): A594.
3. Carroll N, Mutavdzic S, Elliot J, MacKay K, James A. Airway fibroblasts and macrophages and HLA-DR expression in asthma and chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2000; 161(3): A594.
4. Mukherjee S, de Klerk N, Turner A, Thompson M, Ng J, Ng J, James A, Musk AW, Palmer L. Racial differences in the prevalence of indicators of atopy and asthma in Christmas Islanders. *Am J Respir Crit Care Med* 2000; 161(3): A798.
5. Lambert RK, James A, Okazawa M, Paré PD. Are rabbit peripheral airways similar to human infant peripheral airways? *Am J Respir Crit Care Med* 2001; 163:A94.
6. Moffatt MF, Wong KCC, James A, Walley AJ, Chavanas S, Hovnanian A, Musk AW, Cookson WO. Netherton's gene polymorphism and atopy in a general population sample: a new gene for atopic disease. *Am J Respir Crit Care Med* 2001; 163:A199.
7. James A, Bowman J, Cookson H, Fritschi L, James C, Knight D, Lewis L, Mutavdzic S, Pearce-Pinto G, Ryan M, Szollosi I, Ton A, Verheijden M, Whittall D, Wood M, Musk AW. Respiratory symptoms, smoking, lung function and allergy in a central Australian aboriginal community. *Am J Respir Crit Care Med* 2001; 163:A365.
8. Carroll N, Mutavdzic S, James A. Mast cell degranulation is related to asthma severity and varies in different airway wall compartments in asthma. *Am J Respir Crit Care Med* 2001; 163:A872.
9. Palmer LJ, Faux JA, Mukherjee S, Carey VJ, Knuiman MK, James AL, Musk AW, Cookson WOCM. A 26-year follow-up of IgE levels, smoking and lung disease: the Dutch hypothesis revisited. *Am J Respir Crit Care Med* 2001; 163:A909.

Publications

1. Holloway L, Beasley R, Roche WR, **James AL**. The pathology of fatal asthma. In: Asthma and Rhinitis. Eds Holgate S, Busse W. pp 193-202, 2000. Blackwell Science, Oxford.
2. **James AL**. Pathophysiology and pathology of asthma. In: Understanding Asthma. Eds Walls RS and Jenkins CR. pp 29-38, 2000. MacLennan and Petty, Sydney.
3. **James AL**, Carroll NG. Airway smooth muscle in health and disease; Methods of measurement and

- relation to lung function. *Eur Respir J. Series on Airway Smooth Muscle*. F Chung and P Sterk editors. *Eur Respir J* 2000; 15: 782-789.
4. Carroll NG, Perry S, Karkhanis A, Harji S, Butt J, **James AL**, Green FHY. The airway longitudinal elastic and collagen fibre network and mucosal folding in patients with asthma. *Am J Respir Crit Care Med* 2000; 161:244-248.
 5. **James AL**, Carroll N. The role of airway remodeling in fatal asthma. *International Rev of Asthma* 2000; 2(2): 50-55.
 6. Palmer LJ, Burton PR, Faux JA, **James AL**, Musk AW, Cookson WOCM. Independent inheritance of serum immunoglobulin E concentrations and airway responsiveness. *Am J Respir Crit Care Med* 2000; 161(6): 1836-1843.
 7. Uhlig T, Wildhaber JH, Carroll N, Turner DJ, Gray PR, Dore N, **James AL**, Sly PD. Pulmonary vascular congestion selectively potentiates airway responsiveness in piglets. *Am J Respir Crit Care Med* 2000; 161: 1306-1313.
 8. Palmer LJ, Burton PR, **James AL**, Musk AW, Cookson WO. Familial aggregation and heritability of asthma-associated quantitative traits in a population-based sample of nuclear families. *Eur J Hum Genet* 2000; 8: 853-860.
 9. Palmer LJ, Knuiman MW, Divitini ML, Burton PR, **James AL**, Bartholomew HC, Ryan G, Musk AW. Familial aggregation and heritability of adult lung function: Results from the Busselton Health Study. *Eur Respir J* 2001; 17: 696-702.
 10. Moffat MF, Schou C, Faux JA, Abecasis GR, **James AL**, Musk AW, Cookson WOCM. Association between quantitative traits underlying asthma and the HLA-DRB1 locus in a family – based population sample. *Eur J Hum Genet* 2001; 9: 341-346.
 11. Palmer LJ, Cookson WOCM, **James AL**, Musk AW, Burton PR. Gibbs-sampling –based segregation analysis of asthma-associated quantitative traits in a population-based sample of nuclear families. *Genet Epidemiol* 2001; 20: 356-372.