WEST AUSTRALIAN SLEEP DISORDERS RESEARCH INSTITUTE (INC.)

SUMMARY OF RESEARCH ACTIVITY

July 1 2004 – June 30 2005

Level 5, G Block
Queen Elizabeth II Medical Centre
Hospital Avenue
Nedlands
Western Australia 6009
Australia
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DR BHAJAN SINGH  
DIAPHRAGM CONTROL OF BREATHING  
DR BILL FINUCANE

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 2004-2005

2004  
B Singh  
KE Finucane  
Sir Charles Gairdner Hospital Research Foundation  
$10,000  
Lung Volume Reduction with tiotropium in Chronic Obstructive Pulmonary Disease (COPD): Functional Mechanisms and Clinical Implications

2005  
B Singh  
KE Finucane  
Boehringer Ingelheim Pty Ltd  
Pfizer Pharmaceuticals  
Lung Volume Reduction with Tiotropium in Chronic Obstructive Pulmonary Disease (COPD): Improved Dyspnoea: Mechanisms and Clinical Implications

Research Personnel

Dr Richard Warren  
Associate Investigator
Ms Karen Wills  
Research Assistant
Ms Peta Maxwell  
Research Officer

Collaborations

Dr R Chandrasekhar  
School of Electrical, Electronic and Computer Engineering, University of Western Australia;
Mr S Dhaliwal  
Department of Public Health, Curtin University.

Techniques

1. Measurement of diaphragm displacement by radiography, fluoroscopy and ultrasound;

Presentations and Invited Lectures

Local

7. Singh B. Therapy Clinic. RSDC Clinical Meeting, Department of Pulmonary Physiology, Nov 2004.
8. Singh B. Hyperinflation, the Chest Wall and Dyspnoea in COPD. Clinical Meeting, Department of Respiratory Medicine, Nov 2004.

9. Singh B. Control of Ventilation. Respiratory Technologists’ meeting, Department of Pulmonary Physiology, Feb 2005.


11. Singh B. Therapy Clinic. RSDC Clinical Meeting, Department of Pulmonary Physiology, Apr 2005.


13. Singh B. Utilities and Outcomes within a Respiratory High Dependency Unit. Clinical Meeting, Department of Respiratory Medicine, May 2005.


National


International


Publications


**DR DAVID HILLMAN**     **UPPER AIRWAY RESPIRATORY MUSCLES**

**DR PETER EASTWOOD**

### 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 and gastro-oesophageal reflux in non-invasive positive pressure ventilation.

### Grants 2004-2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Principal Investigator(s)</th>
<th>Funding Authority</th>
<th>Project Title</th>
<th>Amount</th>
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<tbody>
<tr>
<td>2002-04</td>
<td>PR Eastwood, DR Hillman, SC Jenkins, N Cecins, D Green, M Phillips</td>
<td>NHMRC (212016)</td>
<td>Improving functional capacity in patients with chronic lung disease with high intensity respiratory muscle training.</td>
<td>$340,000</td>
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<td>2004</td>
<td>PR Eastwood, DD Sampson, DR Hillman</td>
<td>National Health and Medical Research Council - Industry Development Grant</td>
<td>Dynamic in vivo size and shape measurement of the human upper airway using long-range optical coherence tomography</td>
<td>$184,250</td>
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<tr>
<td>2004</td>
<td>D Green, T Ackland, PR Eastwood, D Lloyd, P Fournier, B Blanksby, BWaddell</td>
<td>UWA NHMRC Equipment Grant</td>
<td>Dual energy X-ray absorptiometry (DEXA) machine</td>
<td>$70,000</td>
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<td>2004</td>
<td>PR Eastwood</td>
<td>Medical and Health Research Infrastructure Fund (WA) Department of Health, Government of Western Australia Infrastructure Grant - Round 7</td>
<td></td>
<td>$18,800</td>
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<td>2004</td>
<td>PR Eastwood, DR Hillman</td>
<td>Sir Charles Gairdner Hospital Research Foundation</td>
<td>Imaging of the upper airway using catheter-based optical coherence tomography</td>
<td>$10,000</td>
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<td>2004</td>
<td>S Jenkins, PR Eastwood</td>
<td>Asthma Foundation – Telethon Research Programme</td>
<td>Improving quality of life and functional capacity in middle-aged and older adults with moderate to severe asthma and associated disability</td>
<td>$46,422</td>
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<td>2004</td>
<td>PR Eastwood, B Dawson, G Stewart</td>
<td>Australian Football League Research Fund</td>
<td>Sleep quality and athletic performance: the effect of interstate air travel</td>
<td>$19,949</td>
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<td>2004-2006</td>
<td>PR Eastwood, DR Hillman</td>
<td>NHMRC (303218)</td>
<td>Factors determining collapsibility of the human upper airway during sleep and general anaesthesia</td>
<td>$259,625</td>
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<td>2004-2008</td>
<td>Eastwood, PR</td>
<td>NHMRC (294404) R Douglas Wright Biomedical Career Development Award</td>
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<td>$417,500</td>
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<td>2005</td>
<td>PR Eastwood</td>
<td>Medical and Health Research Infrastructure Fund (WA) Department of Health, Government of Western Australia Infrastructure Grant - Round 8</td>
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<td>$19,918</td>
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2005
PR Eastwood
DR Hillman
N McArdle
D Green
B Stukey
G Sturdy

Sir Charles Gairdner Hospital Research Foundation
The effect of continuous positive airway pressure on blood vessel function and erectile function
$10,000

2005-2007
AD Lucey
PR Eastwood
DR Hillman
DD Sampson
T Balint

Australian Research Council (DP0559408)
Modeling and methods of flow-obstruction dynamics in the human upper airway
$425,000

Research Personnel
Dr Jennifer Walsh
Research Officer (post-doctoral appointment)
Ms Kathleen Maddison
Research Assistant
Ms Danielle Philippe
Research Assistant
Ms Suzanne Lidstone
Administration Clerk
Mr Michael Hibbard
PhD candidate
Ms Kylie Hill
PhD candidate
Ms Kelly Shepherd
PhD candidate
Ms Sian Turner
PhD candidate
Ms Cara Weisbrom
PhD candidate
Louise Richmond
Masters candidate
Ms Melissa Giumelli
Honours candidate
Mr Abdul Halim Bin Mohamed Anwar
Honours candidate

Collaborations
Local
A/Prof S Jenkins
Department of Physiotherapy, Sir Charles Gairdner Hospital; School of Physiotherapy, Curtin University;
Dr P Platt
Department of Anaesthetics, SCGH;
Professor D Sampson
Department of Electronic and Electrical Engineering, University of Western Australia;
Professor P Thompson
Asthma and Allergy Research Institute, Queen Elizabeth II Medical Centre;
A/Prof J Pan
Department of Mechanical Engineering, University of Western Australia;
A/Prof G Allison
Centre for Musculoskeletal Studies, University of Western Australia.

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

International
A/Prof A Schwartz
Johns Hopkins Medical School, Asthma and Allergy Centre, Baltimore, Maryland, USA;
Mr R Brandmeier
MAP Medizin-Technologie GmbH, Martinsreid, Germany;
Mr J Kirkness
Johns Hopkins Medical School, Asthma and Allergy Centre, Baltimore, Maryland, USA.
Techniques
1. Oesophageal impedance
2. Oesophageal manometry
3. Administration of non-invasive ventilation
4. Polysomnography
5. Respiratory muscle training
6. Oesophageal pH monitoring
7. Cycle ergometry

Presentations and Invited Lectures

Local

National


**International**


Publications


** Editorialised: Johnson JE. Which test should be used for patients with symptomatic COPD? *Chest* 2004; 126: 668-670.


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**A/PR ALAN JAMES**

**AIRWAY REMODELING AND INFLAMMATION**

**DR NEIL CARROLL**

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 in collaborative study
   - Assessment of smooth muscle phenotype
     - Immunohistochemistry (co-labeling with smoothelin; CHASM; actin)
     - Transcription factor expression on smooth muscle (CBEP)

2. Airway Inflammation
   - Validation study of biopsy to assess airway and lung inflammation
   - Identification of dendritic cells with immunohistochemical labeling (DC-SIGN)
   - Inflammation in allergen-sensitised and exposed mice

3. Population Studies
   - Busselton Health Survey 2005-2007

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- Random sample of current 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
- Epidemiology of obstructive sleep apnoea
  - WASDRU Sleep database and genetics study
  - Busselton Health Survey

4. Genetic influences on airway disease and allergy
   - Single nucleotide polymorphisms
   - Genome screen
   - HLA-DR

5. SIDS
   - Influence of parental smoking on airway structure and inflammation

6. Clinical Trials

Grants 2004-2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Principal Investigators</th>
<th>Institution</th>
<th>Funding Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-05</td>
<td>AL James, NG Carroll</td>
<td>Western Australian Institute for Medical Research</td>
<td>$63,000</td>
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<tr>
<td></td>
<td></td>
<td>Mechanisms of persistent airway inflammation and airway remodeling</td>
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<td>2003-05</td>
<td>AW Musk, AL James, PN le Souëf, WOC Cookson, G Waterer, M Knuiman, NG de Klerk, J Beilby</td>
<td>Western Australian Institute for Medical Research</td>
<td>$73,000 p.a.</td>
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<tr>
<td></td>
<td></td>
<td>Epidemiological and genetic studies of asthma and chronic airflow limitation: The Busselton Health Study</td>
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<tr>
<td>2004</td>
<td>James, AL Maxwell, PS</td>
<td>Hollywood Private Hospital Research Foundation</td>
<td>$10,000</td>
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<tr>
<td></td>
<td></td>
<td>Characteristics of lymphoid aggregates in smokers with and without airflow obstruction</td>
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<td>2004</td>
<td>Lamb, J James, AL</td>
<td>Asthma Foundation WA</td>
<td>$30,294</td>
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<td>Fibroblasts and myofibroblasts in airway remodeling in asthma and COPD</td>
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<td>2004-2006</td>
<td>Upham, J James, AL</td>
<td>NHMRC (303161)</td>
<td>$83,500 p.a.</td>
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<td></td>
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<td>Effects of allergens on dendritic cell function in allergic asthma</td>
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<td>2005</td>
<td>Musk B James A Beilby J Palmer L Knuiman M</td>
<td>NHMRC equipment grant</td>
<td>$123,915</td>
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<td>2005</td>
<td>James, AL Maxwell, PS</td>
<td>Hollywood Private Hospital Research Foundation</td>
<td>$10,000</td>
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<tr>
<td></td>
<td></td>
<td>Lymphocyte activation in lymphoid aggregates in smokers with airflow obstruction</td>
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</table>
2005  James, AL  Sir Charles Gairdner Hospital Research Foundation  Inflammation and hyperplasia/hypertrophy of airway smooth muscle in asthma and representativeness of bronchial biopsies – a stereological study  $10,000

2005  Elliot, J  Sir Charles Gairdner Hospital Research Foundation  The mean distance between airway alveolar attachments and its relationship to alveolar number in the lung  $10,000

2005-2007  James, AL  NHMRC (343601)  Hyperplasia and hypertrophy of airway smooth muscle in asthma  $281,000

2005-2007  Musk, AW  NHMRC (353532)  The changing prevalence of asthma and chronic obstructive disease in Australia  $729,380

Research Personnel

Mr John Elliot  Research Officer
Ms Jasmine Lamb  Research Officer
Ms P Maxwell  Research Officer
Mrs Cathryn Jensen  Research Assistant
Mr Mark Carroll  PhD candidate
Ms Hiliary Hii  Honours candidate
Mr Matthew Moller  Honours candidate

Collaborations

Local
Prof A Baddeley  School of Mathematics, University of Western Australia;
Dr K Finucane  Department of Pulmonary Physiology, Sir Charles Gairdner Hospital;
Dr D Hillman  Department of Pulmonary Physiology, Sir Charles Gairdner Hospital;
Clinical Prof AW Musk  Department of Respiratory Medicine, Sir Charles Gairdner Hospital;
Mr B Noffsinger  Department of Pulmonary Physiology, Sir Charles Gairdner Hospital;
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;
Prof N Berend  Woolcock Institute of Medical Research, University of Sydney, New South Wales;
Prof J Black  Woolcock Institute of Medical Research, University of Sydney, New South Wales;
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 P Robinson  Department of Thoracic Medicine, Royal Children’s Hospital, Victoria;
Dr C Salome  Woolcock Institute of Medical Research, University of Sydney, New South Wales;
Prof H Walters Department of Epidemiology and Preventive Medicine, Monash Medical School, Alfred Hospital, Victoria;
A/Prof J Wilson Department of Respiratory Medicine, Alfred Hospital, Victoria.

International
Prof T Bai MacDonald Research Laboratory, St Paul’s Hospital, Vancouver, Canada;
Prof M Bonsignore Instituto di Fisopatologia, Italy;
Dr F Green Faculty of Medicine, University of Calgary, Canada;
Prof J Hogg MacDonald Research Laboratory, St Paul’s Hospital, Vancouver, Canada;
Dr D Knight MacDonald Research Laboratory, St Paul’s Hospital, 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 WOCM Cookson Henry Wellcome Building for Human Genetics, Oxford University, England;
Prof E Spindel Oregon Regional Primate Research Centre, Oregon, USA.

Techniques
1. Morphometry and stereology
2. Immunohistochemistry
3. Physiology - airway responsiveness; forced oscillation technique
4. Exhaled nitric oxide
5. Atopy
6. Induced sputum.

Presentations and Invited Lectures

Local

National

International
1. Carroll M, James A, Chapman C, Carroll N. Comparison of mast cell densities in


**Publications**


**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
   - Positional therapy: new appliances

3. Heart rate monitoring to detect psychiatric conditions and sleep apnoea

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

5. Sleep studies in the Busselton Health Survey.

Collaborations

Local
A/Prof Hans Stampfer, Department of Psychiatry, UWA;
Mr W Noffsinger, Department of Pulmonary Physiology, West Australian Sleep Disorders Research Institute;
Dr N McArdle, Department of Pulmonary Physiology, West Australian Sleep Disorders Research Institute;
Dr Scott Phung, Department of Respiratory Medicine, Royal Perth Hospital.

Techniques
1. Lasers
2. Heart rate monitors
3. Radical oximeters

Presentations and Invited Lectures

Local

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
Dr Kevin Gain, Royal Perth Hospital

Presentations and Invited Lectures

Local

International

**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.

**Grants 2004-2005**

<table>
<thead>
<tr>
<th>Year</th>
<th>Investigator</th>
<th>Sponsor</th>
<th>Description</th>
<th>Total</th>
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<tr>
<td>2001-04</td>
<td>D Christiani S Mukherjee</td>
<td>National Institutes of Health (USA) / National Cancer Institute</td>
<td>Biomarkers of carcinogen exposure and oxidative injury</td>
<td>$160,000</td>
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<td>2005</td>
<td>S Mukherjee</td>
<td>Hollywood Private Hospital Research Foundation</td>
<td>Establishment of a population-based database for sleep apnoea</td>
<td>$10,000</td>
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<td>2005</td>
<td>S Mukherjee</td>
<td>Sir Charles Gairdner Hospital Research Foundation</td>
<td>Establishment of a population-based database for sleep apnoea</td>
<td>$10,000</td>
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**Collaborations**

**Local**
Clinical Prof AW Musk, Department of Respiratory Medicine, Sir Charles Gairdner Hospital; and Prof Nick de Klerk, Department of Biostatistics, Telethon Institute for Child Health Research.

**International**
Prof. David Christiani, Harvard School of Public Health, USA.

**Publications**

1. Kim JY, Mukherjee S, Ngo L, Christiani DC. Urinary 8-Hydroxy-2'-deoxyguanosine as a biomarker of oxidative DNA damage in workers exposed to fine particulates”. Environmental Health Perspectives, 2004; 112: 666-671.
**SUMMARY**

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
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<tbody>
<tr>
<td>Number of research staff</td>
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<tr>
<td>Number of students</td>
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<tr>
<td>Honours</td>
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<td>Masters</td>
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<td>PhD</td>
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<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
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<td>$3,245,558</td>
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