Annual Report 2010

Waikato Medical Research Foundation

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Chairman's Report

Despite the modest amount of funding the Foundation is able to distribute for local medical and health research, I am able to proudly report some excellent outcomes for the people of Waikato. The work of Deborah Harris, our first registered nurse practitioner, on hypoglycaemia has been recognized by the Health Research Council and further work by the group into "Sugar Babies" is being funded by a large HRC Grant. The bulk of this work is done in our hospital.

Two other young researchers, Dr C. Chang and Dr M. Elston, funded by the Foundation have completed overseas study and have been appointed to our senior medical staff. These two are examples of professionals supported locally coming back to care for our patients. Supporting teaching and research is vital to maintaining and raising the level of care of the people in our community. We need the support of everyone to enable us to continue and expand this vital work. Quality teaching goes hand in hand with research. Each in turn leads to quality patient care.

Once again, we are very grateful to Trust Waikato for their substantial help. We also thank all donors for their support, and the support of the Waikato Branch of the Cancer Society.

Our fund has been maintained without loss despite the recession – in fact, our fund has increased. For this, we thank Warwick Aitken who chaired the Finance Subcommittee. Unfortunately Warwick has resigned as a trustee; we are most grateful for his years of contribution. We also regret the resignation of Professor Richard Bedford who contributed for many years to our Grants Subcommittee and generally as a trustee.

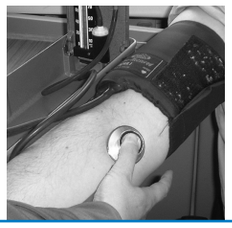
It is my pleasure to inform you that Mere Belzer, CEO of Te Runanga o Kirikiroa has joined us as a trustee. She is an experienced researcher, and a very welcome addition to the Grants Subcommittee.

We are working steadily to raise the profile of our Foundation so that we are able to support our community further. We have received excellent support from our Patron, Dr Peter Rothwell. I thank him and all the Trustees for their voluntary contributions.

Dr Noel Karalus
Chairman

"Supporting teaching and research is vital to maintaining and raising the level of care of the people in our community."

Report of the Grants Committee



This year the foundation received 21 applications requesting a record total of $586,036. This far exceeded the funds available so many deserving applications were unsuccessful. With assistance from Trust Waikato, $129,846 was distributed among 8 applications. Many applications were cross institutional.

This year the applications supported included work on: tissue oxygenation and wound healing in vascular surgery, the outcomes of prostate antigen testing in general practice, the effects of ultra-filtration on the inflammatory response in patients undergoing cardiopulmonary bypass, immune defence proteins in human milk, agents that may be able to control of epileptic seizures, differences in responses of different ethnic groups to anti-platelet therapies, factors contributing to successful weight management practises in the Waikato, and measuring and treatment methods for low sugar in premature babies. The first and last two awards support the conclusion of post graduate projects.

With the seed support from the WMRF, many of these projects generate data for more substantial support elsewhere and are translated into useful tools products and services.

I thank the Grants Committee: Maggie Fisher, Amanda Oakley, Roy Daniels, Michael Jameson and our newest member, Mere Belzer for the reviewing and scoring of the applications. This was a significantly larger task than was the case in previous years. A special thank you to the WMRF administrator Robyn Fenneman for gathering, organizing, presenting the applications and responses to applications.

Adrian Molenaar
Chair, Grants Committee

WMRF Funded Projects Grant Round 2010	
• Tissue Oxygenation and Wound Healing in Vascular Surgery Dr N. Chiang (Vascular Surgery, Waikato Hospital)	$4996
• Outcomes of PSA testing in General Practice Dr R. Lawrenson (Waikato Clinical School, Waikato Hospital)	$11,250
• Investigating the effects of ultra-filtration on the inflammatory response in patients undergoing cardiopulmonary bypass Dr Adam El Gamel (Cardiology, Waikato Hospital)	$24,000
• Immune Defence Proteins in Human Milk : Differences between preterm and term deliveries Dr Thomas Wheeler (AgResearch)	$20,600
• Development of mimetic peptides for targeted modulation of gap junctions in the cerebral cortex - potential for control of epileptic seizures Dr Gregory Jacobson (University of Waikato)	$30,000
• Genetic Effects in NZ Ethnic-groups on Therapeutic platelet Inhibition with Clopidogrel during PCI (Genetic-PCI) Dr Gerry Devlin (Cardiology, Waikato Hospital)	$27,000
• Are we there yet? Experiences of successful weight maintenance in the Waikato Mr Bryan Gibbison (Diabetic Department, Waikato Hospital)	$2,000
• The Sugar Babies Study Ms Deborah Harris (Newborn Unit, Waikato Hospital)	$10,000

Reports from Grant Recipients

2010 Grants

Grant #166, Dr Nathaniel Chiang
Tissue Oxygenation and Wound Healing in Vascular Surgery

Poor wound healing and failure to salvage a patient's limb as a result of unsuccessful revascularisation are the "banes of a vascular surgeon's life". Evaluating methods to reduce these risks will have significant impact in our practice, especially for high-risk vascular patients.

My PhD comprises various studies that primarily target wound healing and tissue oxygenation. Wound healing activity is measured quantitatively using a surrogate biochemical marker to collagen deposition called hydroxyproline. This method is validated worldwide. Analyses of growth factors and their mRNA will also be performed and is essential to investigate the wound environment at a molecular level.

Tissue oxygenation is measured in two ways. An innovative device called OxyVu™ uses hyperspectral technology to quantify oxy- and deoxy-haemoglobin. It provides detailed 'oxygen anatomy' around the area of interest. This machine was bought into the unit in December 2008. Transcutaneous oxygenation measurement system (TCOM) uses a heated transducer to detect tissue oxygen levels around the electrode. The purchase of 5 TCOMs machines was secured thanks to the Waikato Medical Research Foundation Grant last year. They have been used to validate the quality of OxyVu™ and support my other PhD studies.

Wound healing is also studied quantitatively by volumetric assessments. This is essential to monitor the progress of wound healing. Two portable devices, namely Silhouette Mobile™ and FastSCAN™, use laser technology to quantify the wound dimensions. Our recent validation study confirmed their measurements are comparable to CT reconstructions. These devices were acquired 3 months ago and the costs were not included in my original PhD budget.

This grant will fund the development kit essential for analyses of growth factors and their mRNAs in aid for my PhD completion. The analyses are crucial in two key studies of my PhD, namely:

- Effects of supplemental peri-operative oxygen, extended peri-operative warming and peri-operative Ilomedin (a prostacyclin analogue) on wound healing, tissue oxygenation and patient outcome in infra-inguinal surgery: A randomised controlled study.
- Volumetric and Growth Factors assessments for Topical Negative Pressure Therapy: A randomised controlled study.

The benefit of my PhD is of two folds. It provides objective evidence that simple conservative methods can improve tissue oxygenation and wound healing in vascular surgery at a tissue and molecular level, thus reducing patients' morbidity by improving tissue viability.

Grant # 168, Dr Gerry Devlin
Genetic Effects in New Zealand Ethnic-groups on Therapeutic platelet Inhibition with Clopidogrel during PCI (GENETIC-PCI)

Authors of study: Dr. D. Kelly and Dr. G. Devlin

Percutaneous coronary intervention (coronary angioplasty and stenting, PCI) is the dominant form of revascularization treatment for coronary artery disease worldwide. PCI, by opening coronary narrowings which may cause angina pectoris and heart attacks has proven benefit in relieving angina, and improves survival compared with medical (tablet-only) therapy when performed in the setting of unstable angina or heart attack (myocardial infarction, MI).

The main underlying pathophysiological cause of MI is breakdown of pre-existing fatty atheromatous plaques in coronary arteries, which cause clot to form which occludes the artery, thus starving the heart muscle of blood and oxygen. If the occlusion is transient or partial, unstable angina may result, and if an occlusion persists myocardial infarction and irreversible heart muscle damage ensues.

Circulating platelets in the blood are central to the process of clot formation in arteries. Inhibition of platelets is therefore central to both the medical management of MI and crucial during PCI. Both aspirin and a 'super-aspirin' called clopidogrel are highly effective in inhibiting platelets and reducing the incidence of recurrent MI. Both drugs are essential during and following PCI to prevent clot re-forming within an implanted coronary stent. Clopidogrel discontinuation carries a high risk of stent clot or thrombosis, which may be fatal. There is well documented 'Clopidogrel-resistance' in certain patients, but little data exist on ethnic influence on platelet activity.

Emerging evidence (including recent work by researchers at the University of Auckland) suggests there may be significant genetic variability in platelet activity between individual patients and between patients of different ethnic origins. Differences in inter-ethnic liver function and clotting (e.g. sensitivity to the anticoagulant Warfarin) have recently been described. No clinical measurement of platelet activity in New Zealand patients undergoing PCI has been described.

Our study, GENETIC-PCI seeks to determine whether there is a clinically important difference in platelet activity between Maori and New Zealand European ethnic groups undergoing PCI. Using a simple point-of-care blood test assay we will determine the prevalence of 'Clopidogrel-resistance' in Maori and New Zealand European patients. We will determine whether Clopidogrel resistance (high post-treatment platelet activity) correlates with peri-procedural MI (postulated to be due in part to minor clotting episodes) or long-term clinical outcomes. The testing involves a simple blood test and no alteration to usual clinical care.

GENETIC-PCI will be the first specific platelet activity in New Zealand PCI patients. The setting for the study is a busy tertiary cardiac centre with a record of published clinical research. The data from GENETIC-PCI will be novel, important and uniquely relevant to New Zealand practice. Additionally the results of this study will pave the way for targeted future clinical studies with novel anti-platelet agents, and will potentially allow us to reduce the risk of fatal stent thrombosis by identifying patient who require additional anti-platelet treatment.

Grant # 169, Dr Adam El Gamel
Investigating The Effects Of Ultra-Filtration On The Inflammatory Response In Patients Undergoing Cardiopulmonary Bypass

Abstract: Coronary artery bypass surgery (CABG) performed with cardiopulmonary bypass (CPB) is associated with an intense inflammatory response that effects a number of key vascular and endothelial pathways that lead to organ dysfunction. Whilst this inflammatory response is not abolished by avoidance of the bypass machine, performing CABG surgery on the beating heart (OPCAB) without CPB may reduce this inflammatory response; this in turn may lead to improved clinical outcomes particularly in patients with significant medical co-morbidity (for example those with renal dysfunction or cerebrovascular disease). Modified perfusion strategies such as the use of ultra-filtration (UF) during CPB may also help to diminish this inflammatory response. Whilst the role of UF in reducing cytokine activation and inflammation is well documented in paediatric patients during CPB, it is not clear if UF has a benefit in routine adult cardiac surgery.

We aim to prospectively study the inflammatory response in patients undergoing routine CABG surgery with CPB (n=40) and compare them to an aged matched control group undergoing OPCAB surgery (n=20). In addition the CABG group undergoing CPB will be sub-divided into those managed with intra-operative ultra-filtration (CABG+UF; n=20) and those managed with a standard bypass regime without ultra-filtration (CABG-UF; n=20). Blood samples will be collected in all groups prior to surgery, prior to sternotomy, during surgery and again in the ICU to enable a profile of the overall inflammatory response to be generated. Established markers of inflammation including interlukines (IL-10, IL-6), tumour necrosis factor alpha (TNF-a) and c-reactive protein CRP will be assessed. This will enable us to investigate (a) if OPCAB surgery is associated with a reduction in inflammatory response compared to conventional surgery performed with CPB and (b) if in patients exposed to cardiopulmonary bypass use of modified ultra-filtration will help to ameliorate this inflammatory response.

Methods of reducing activation of inflammation in patients with coronary artery disease requiring revascularisation may lead to a reduction in morbidity and mortality.

This project hopes to offer an insight into 2 simple techniques that may provide this, off pump surgery and intra-operative ultra-filtration.

Grant # 171, Ms Deborah Harris
The Sugar Babies Study: a randomised controlled trial

Abstract: Hypoglycaemia (low blood sugar) is the only common preventable cause of brain damage in babies. It is most common in the first forty-eight hours after birth, and is a common reason for admission to the Newborn Intensive Care Unit. Oral carbohydrate (sugar) is the first line of treatment of the conscious hypoglycaemic diabetic patient. However, oral treatment in babies has not been investigated. Waikato Hospital is the only hospital in Australasia to use 40% dextrose gel for treatment in babies. However, there is no evidence to support this practice. Furthermore, blood glucose levels are routinely measured intermittently. However blood glucose levels are known to fluctuate following birth and therefore periods of hypoglycaemia may be missed. We have developed experience with continuous glucose monitoring in the newborn.

Hypothesis: That 40% dextrose gel is more effective than feeding alone in reversing neonatal hypoglycaemia. That intermittent blood glucose monitoring does not detect all episodes of hypoglycaemia.

Trial design: We propose a randomised, placebo controlled, double-blinded study in hypoglycaemic babies ≥ 35 weeks gestation, comparing the incidence of treatment failure in babies randomised to receive either dextrose gel 40% or a placebo vehicle gel.

Method: Where possible babies ≥ 35 weeks gestation who are at risk of hypoglycaemia will be enrolled prior to birth. Following birth a continuous glucose monitor will be applied, and remain in place for 48 hours. If during routine clinical blood tests hypoglycaemia is diagnosed, babies will be fed, and in addition will be randomised to receive either 40% dextrose gel or a placebo vehicle gel. The baby will receive up to two doses of gel 30 minutes apart. If hypoglycaemia persists, the baby will be admitted to the Newborn Intensive Care Unit for on-going care.

Outcomes: The primary outcome is treatment failure, defined as a blood glucose level < 2.6mM 30 minutes after the second of two treatment attempts.

Secondary outcomes include: time taken to achieve an interstitial glucose level >2.6mM for >1 hour; incidence of recurrent hypoglycaemia after an initial successful treatment; admission to the neonatal intensive care unit; frequency and total volume of formula administered in the first 48 hours; rate of full breast feeding at two weeks of age

Significance and expected benefits: Hypoglycaemia is very common in the newborn period. It is the most common cause of preventable brain damage in the newborn period. The diagnosis and management remain controversial. The majority of babies are admitted to the Newborn Intensive Care Unit for treatment. We hope to determine the effectiveness of an oral carbohydrate treatment regime that will reverse hypoglycaemia and allow the mother and baby to remain together. This may result in improving the rate of breast feeding and decreased hospital costs. In addition we aim to determine whether our current regime for intermittent blood glucose monitoring can be improved.

Completed Reports
from 2008 / 2009 Recipients

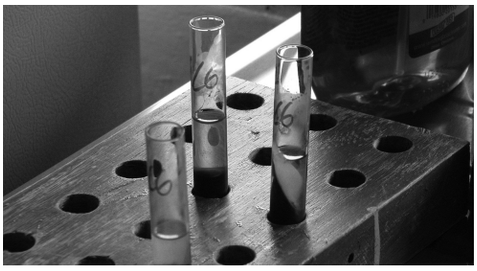
Grant # 137, Dr Leong Leow
Vitamin D, Innate Immunity and Outcomes in Pneumonia and Exacerbations of COPD

Background: Vitamin D has been shown to regulate the production of the antimicrobial peptides human cathelicidin and human beta defensin-2. We hypothesised that vitamin D deficiency would be associated with reduced serum levels of antimicrobial peptides and worse outcomes in patients admitted with community acquired pneumonia and exacerbations of Chronic Obstructive Pulmonary Disease (COPD).

Methods: We performed a prospective, descriptive study of 185 patients admitted with pneumonia or exacerbations of COPD during the winter of 2008. We measured serum levels of 25-hydroxyvitamin D and explored its relationship with serum cathelicidin, beta defensin-2 levels, and markers of severity including mortality.

Findings: 25-hydroxyvitamin D deficiency (<50nmol/L) was common in this population. Severe 25-hydroxyvitamin D deficiency (<30nmol/L) and lower cathelicidin levels were independently associated with higher 30-day mortality. These associations persisted after adjusting for age, sex, diagnosis (pneumonia or COPD), severity of the acute illness (CURB65 score), and co-morbidities. However, 25-hydroxyvitamin D levels were not correlated with either serum cathelicidin or beta defensin-2.

Interpretation: In patients admitted to hospital with pneumonia and exacerbations of COPD during the winter months in New Zealand, severe 25-hydroxyvitamin D deficiency and lower serum cathelicidin levels were independently associated with increased 30-day mortality. Contrary to our hypothesis, serum 25-hydroxyvitamin D levels were not associated with serum levels of the antimicrobial peptides cathelicidin or beta defensin-2.



Grant # 139, Professor J. Sleigh
Are gap junctions important in neocortical seizures?

The Waikato Medical Research Foundation awarded a grant of $30,000 to part-fund the salary of a visiting post-doctoral fellow (Dr Jonathan Mason) for a year. We are very grateful to the WMRF for funding the project.

We have found that knockout of the gap junction (Cx36) protein produces a markedly increased sensitivity to seizures – thus indicating that gap junctions between, and within, populations of inhibitory neurons act primarily to increase the suppressive effects on the excitatory neurons. Therefore gap junctions act as part of a physiological homeostatic mechanism that is protective against the development of seizures.

This work also identifies Cx36 gap junctions as potentially novel therapeutic targets in epilepsy. Drugs that open these junctions (or at least prevent physiological closure of these junctions) could have a significant anti-epileptic effect. Other gap junction proteins do not appear to show compensatory over-expression. In contrast, the neocortical slices are resistant to the pro-seizure effect of the anaesthetic drug etomidate.

This is in agreement with our theoretical modelling work, which suggests that the pro- or anti-convulsant effects might be completely different – depending on whether the cortex was in a previously active or quiescent state. Initially Dr Mason encountered some difficulty in the software implementation of the protocol required to control the somewhat delicate (but very accurate) electrical stimulation and recording hardware (Agilent E5270B). However these difficulties were eventually overcome and he has obtained reliable recordings from a number of neocortical slices. This electrical impulse data requires further analysis and development of new stimulus protocols. This work will be further developed and will form the basis of a PhD thesis by Mr Maher Elbohouty.

Research Publications: Two papers have been submitted for publication.

Dissemination & Implementation of Research Results: We plan to present these results at the ComBio conference in Christchurch in December, and next year at the AWBRC.

Grant # 155, Dr A. Hodgkinson
Comparison of dairy and soy protein in a model of gastrointestinal inflammation

In a transgenic animal model of gastrointestinal (GI) inflammation, we observed highly significant differences in the health outcomes of mice when they were fed diets that contained either dairy or soy protein.

The aim of this project is to characterize the gene expression of known inflammatory cytokines and receptors using tissues from this animal experiment.

Colonic tissues were analysed for expression of 84 inflammatory cytokines and their receptors. The RNA expression levels obtained for each gene of interest were first normalized to housekeeping genes. Then normalized expression level of the control mice was compared with the normalised expression level of the transgenic mice. Fold changes in normalized gene expression were determined to identify up-regulation and down regulation of specific genes.

For transgenic mice fed the dairy-protein based diet, 28.6% of the genes were up-regulated more than 3-fold compared with their controls and for mice fed the soy-protein based diet, only 10.7% of the genes were up-regulated. Comparison of the two transgenic groups showed that more than 10% of the genes were more highly expressed in the dairy-protein fed mice.

The overall results suggest that there was a greater inflammatory response induced in the colon of the dairy-fed IL-10-/- mice compared with the soy fed IL-10-/- mice. Matched to control mice on the same diet, inflammatory signaling was always higher and a greater number of genes were involved in dairy-fed IL-10-/- mice compared with soy-fed IL-10-/- mice. These data support the earlier observations of the trial. Although, some inflammatory genes were up-regulated in the soy-fed IL-10-/- mice compared with controls, they have not caused the same severity of symptoms as those mice fed-dairy.

The results support the hypothesis that soy is a more beneficial protein source for patients with gastrointestinal inflammatory disease than dairy protein.

Grant # 160, Dr T. Vasudevan
Validation Of The Fastscan™ & Silhouette Mobile™ - Handheld Wound Measurement Devices.

Abstract: Introduction: FastSCAN™ (FS) and Silhouette Mobile™ (SM) are portable devices which use laser-camera technology to objectively and quantitatively measure the surface area, depth and volume of wounds. We hypothesise that FS and SM are effective bedside technology that can be used to compare wound healing outcomes.

Method: This was the first wound measurement study involving human with leg ulcers using the FS and SM. The validity of both devices was tested against the gold standard, 3D CT reconstruction. Patients with at least one sizeable wound or ulcer in the lower extremities were recruited. They underwent simultaneous wound measurement using CT, FS and SM scanning. Appropriate statistical analyses was conducted using Bland-Altman plots and ICC's with $p<0.05$ as significant.

Results: Sixteen wounds in 11 patients (aged 57-86 years, median 77 years) were studied over ten weeks. Both FS and SM consistently underestimate wound depth and volume compared with CT scanning, due to systematic bias. On average, CT volume and depth was 1.3 and 4.1 times greater than FS, respectively. CT volume and depth was 2.2 and 14.9 times greater than SM. Bland-Altman analyses showed a positive linear correlation for CT and SM outcomes ($p<0.01$), but not for FS.

The intra- and inter-operator variability was determined through ICC's which were higher for the SM (0.98, $p<0.05$) versus FS (0.79, $p<0.05$).

Conclusion: Measurements from SM correlate to CT with greater relative accuracy. They offer benefits as non-contact and cost-effective devices, with reduced radiation risk. SM is more clinically valuable than FS. This study provides a basis for a larger study comparing wound intervention outcomes.

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2010 Financial Highlights

Waikato Medical Research Foundation (Inc)

These financial highlights have been extracted from the audited financial statements of the Waikato Medical Research Foundation (Inc). A full copy of the audited financial report for the year ended 31 May 2010 is available from the Foundation's office, Peter Rothwell Academic Centre, Waikato Hospital, or on the website www.wmrf.org.nz

Statement of Financial Position as at 31 May 2010	**2010**	**2009**
Accumulated Funds	$1,261,614	$1,256,666
Represented by:		
Current Assets		
Westpac	**143,125**	30,733
ASB	**140,607**	51,311
Staples Rodway Trust Account	**13,092**	96,778
	296,824	178,822
Investments		
Cash and Equivalents	**79,708**	76,268
NZ Fixed Interest	**886,469**	968,291
NZ Listed Property	**71,607**	61,414
Australian Investments	**54,159**	43,753
American Investments	**8,103**	8,827
British Investments	**1,527**	1,495
	1,101,573	1,160,048
Total Assets	**1,398,397**	1,338,870
Current Liabilities		
Accounts Payable	**136,783**	82,204
Net Assets	**$1,261,614**	$1,256,666

Statement of Financial Performance as at 31 May 2010		
Income	**2010**	**2009**
Dividends	**12,797**	10,494
Donations	**9,560**	38,877
Foreign exchange gain	**-**	2,508
Grant - Trust Waikato	**65,000**	65,000
Interest	**65,930**	79,427
Income on realisation of investments	**-**	827
Unrealised gain on investments	**28,731**	-
	182,018	197,133
Expenditure		
Administration expenses	**12,158**	13,374
Advertising and promotion expenses	**3,069**	3,919
Audit fee	**4,500**	2,250
Fees paid to auditor for other services	**5,465**	5,267
Foreign exchange loss	**729**	-
Grants	**141,846**	115,516
Loss on realisation of investments	**4,010**	-
Portfolio management fees	**5,293**	5,074
Unrealised loss on investments	**-**	35,612
	177,070	181,012
Net surplus/ (deficit)	**$4,948**	$16,121

WMRF needs your support

There are several ways you can help
- Make a donation to general research
- Bequests

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