2017 ANNUAL REPORT

OTAGO
MEDICAL RESEARCH FOUNDATION

CONTENTS

OBJECT OF THE FOUNDATION

There is not one person alive today who has not benefitted from medical research.

The Object of the Otago Medical Research Foundation: the furtherance of medical research in Otago.

We fund world class research, equipment and facilities for Otago's highly talented medical community of scientists, students, practitioners and lecturers.

Our recipients contribute invaluable medical knowledge that can be applied to medicine and prevention in the future, and in doing so we also retain top medical talent and intellectual property in Otago.

MEDICAL RESEARCH IS A LIFE CHANGER.
YOU'RE A LIFE CHANGER.

The answers unearthed through medical research irrefutably lead to greater quality of life for society – through earlier diagnosis and treatment. Since the Foundation was established in 1967, it has identified and funded more than $8.5 million worth of grants and scholarships, with much of the work undertaken now acclaimed around the world.

The lives of tens of millions of people have ultimately been improved by the research funded by the Otago Medical Research Foundation, made possible by you, our generous supporters.

IT ALL STARTS SOMEWHERE.

The Foundation helps to fund medical research projects and scholarships which are highly novel and scientifically worthy, but due to their early exploratory nature don't attract the interest of larger funding agencies.

However, in the world of medical research what the Foundation launches cannot be underestimated. Once that initial research has been completed and the answers reported, it often opens up new areas of investigation for bigger entities to develop.

So the research never stops and many of our esteemed alumni are now global leaders in their medical fields.

EVERYONE BENEFITS FROM MEDICAL RESEARCH.

There is not one person who has not benefitted from answers found through medical research. Whether that be personally, through parents or children, partners or siblings, work mates or their friends. We will all know many who wouldn't be with us had it not been for the discoveries made and the earlier diagnosis and less invasive treatment that research unveils.

It is irrefutable that from medical research we all benefit.

Charities Registration Number CC33444

CHAIRPERSON'S REPORT

49TH ANNUAL REPORT YEAR 2017

$475,524
Increase of
$35,564
Since 2016

Total amount funded
Since the Foundation's inception
$8,536,697

It is with pleasure that I present the 49th Annual Report on the Otago Medical Research Foundation's activities for the 2017 financial year.

Financial Extract

During the year under review, the Foundation approved Grants totalling $475,524, an increase of $35,564 on last year's total of $439,960. Since the Foundation's inception, $8,536,697 has been spent on Medical Research in Otago.

This year marked the 20th year in which the Otago Community Trust has awarded an Annual Grant to the Foundation with the details of grants awarded from this year's funding being published in the Scientific Committee Report. This brings the total grants received from the Otago Community Trust to $1,421,000 a truly generous contribution. On behalf of all members of the Foundation and all Researchers based in Dunedin I would like to sincerely thank the Otago Community Trust for their very generous, and much needed, contributions.

The Foundation is deeply indebted to those people who have named the Foundation as a beneficiary in their wills. Medical research is a never ending activity and the role of the Foundation will continue as long as there are medical scientists willing to ask critical questions and people willing to help fund these researchers in their quest for the vital answers. I would ask members to consider the Foundation when preparing their wills. A bequest to the Foundation will be effectively used and your influence will be felt beyond your lifetime.

The extract from the Financial Statements, as published elsewhere in the Annual Report, shows a deficit for the year of $10,703 compared with a surplus for the previous year of $80,903. There are two main contributors to this result, Income from Grants is down $63,800 and Research Grants paid have increased $35,564. Part of the reduction in Income from Grants can be attributed to the timing of spending prior grant money. The increase in Promotion Expenses has resulted in additional income being received.

As the Foundation endeavours to invest surpluses in project grants rather than build up funds this is not a bad result but we would like to see an increase in the receipt of further injections of capital for investment, which would help to counter the reduced investment rates that we earn on our conservatively invested funds.

The Investment Sub-Committee has continued to face the challenge of finding suitable low risk investments while acknowledging that income and growth are also important. It is pleasing to report that at balance date, the market value of our Company Securities and Shares shows an unrealised gain on cost of $721,843, which is 16.19% of cost.

At 31 March, 2017, Accumulated General Funds total $486,631, and Accumulated Special Funds $4,453,354, a total of $4,939,985, both these figures comprising Capital and Income.

Events subsequent to 31 March

While this report is intended to cover the Foundation's activities for the year ended 31 March, it would be remiss of me not to mention two significant events that have occurred since that date.

1) Director of Development:

An important change occurred in the above position and spans a period covering prior to 31 March and post 31 March.

On 30 January, 2017, Steve Davie informed Mike Horne and I that he had decided to relinquish his contract, suggesting that he had "run out of puff", (albeit that we had certainly not seen any evidence of it)!

The Executive Sub-Committee undertook the task of finding a suitable replacement and in May the appointment of Susan Sims was communicated to Council and other parties, with Susan starting on 19 June.

To ensure a seamless experience for our members and supporters, and also in acknowledgement of Steve's exceptional organisation and Master of Ceremonies skills, Council was delighted that Steve accepted a transitional Event Manager role through to, at least, the end of February, 2018.

It is true to say, that without Steve, the Foundation would not have the high and favourable public profile that it now enjoys. Prior to his appointment as Director of Development in 2010, the Foundation was, to the general public, a very much low key and not well known funder of Medical Research in Otago. With his appointment, the public began to learn much more and be informed about the research that the Foundation was funding. The consequence of this has been that a large increase in funding was acquired for research during Steve's term as Director of Development and continues under his Events Manager's role.

Thank you Steve.

Welcome to Susan who brings a wealth of experience and connections to the position, having worked in programme management in New Zealand, as well as for a consulting firm in Sydney and New York. Susan was previously the Programme Manager of Audacious, a University of Otago, Otago Polytechnic and Dunedin City Council initiative based in Dunedin to encourage student entrepreneurs. She has also served as Marketing Manager in the University of Otago's Research and Enterprise Office.

Susan is looking forward to combining her management skills and research knowledge to ensure the community understands the importance of the medical research funded by the Foundation, and is keen to further leverage links between researchers and business.

Originally from Dunedin, Susan completed a double degree in English and Management at the University of Otago

2) Peter Gibson

On 24 June a former Chair of the Foundation, Peter Gibson passed away after battling the effects of a severe head injury resulting from a fall in 2007. Peter was Chair of the Foundation at the time of his fall and sadly he was unable to continue his association with the Foundation after this accident.

Peter was the son of Henry (Harry) Gibson who was Chair of the OMRF Council and Executive Committee and, I assume, Honorary Solicitor, from the date of the inaugural meeting of the Council on September 26 1967, until his untimely death on October 10, 1971.

Following his father's death, Peter accepted the position as the Foundation's Honorary Solicitor, was elected as a Members Representative on Council at the 1974 AGM, appointed Deputy Chair on 12 August, 1974 and appointed Chair on September 22, 1981.

Peter continued actively as Chair until July, 2007 and he was made an Honorary Life Member of the Foundation following the 2007 AGM.

Having sat beside Peter at many Council and Annual General Meetings I appreciated the contribution that he made to the Foundation and on behalf of all associated with the Foundation I express our sympathy to Peter's family.

Council Membership

There have been 2 resignations from elected Council Members since the last AGM. Dr Jenny McMahon tendered her resignation at the end of September and Mrs Judy Bevin, who has significant Governance and Business skills, was co-opted by Council to fill the vacancy and has attended meetings of Council since December 6.

In February, Sarah Saunderson-Warner tendered her resignation due to her work commitments for the upcoming year. At the time of writing this report the vacancy left by Sarah's resignation had not been filled.

Both Jenny and Sarah contributed greatly to the Foundation during their time on Council with their knowledge and experience and the Foundation thanks them sincerely for the time and energy they devoted to Council affairs.

Dr Lyn Wise, the new President of the Otago Medical School Research Society attended her first Council meeting on 7 March, 2017, and we thank the previous President, Assoc Prof Joel Tyndall sincerely for his positive contribution to Council meetings during his term as a Council Member and welcome Lyn to the Council table.

During the year under review, Elected Member Mr Ron Lewis advised that he was unsure as to how many meetings he would be able to attend and while still happy to be involved he suggested, with the future in mind, that perhaps Michael Milne could be co-opted on to Council. Michael works with Ron at Craig's Investment Partners and has an understanding and involvement with the Foundation's Investment Portfolio. This suggestion was agreed to and Michael has contributed at Council meetings since December.

Ron has now tendered his resignation to take effect from the 2017 AGM and on behalf of the Foundation I thank Ron most sincerely for his contribution, which began as a member of the Investment Sub-Committee, which held its 1st meeting on 27 July 2000, and as an Elected Council Member from 17 October 2006.

Thanks

Firstly, to all those Trusts, Companies, Individuals, Members and Non–Members listed in this Annual Report who have supported the Foundation in the year under review. The Foundation is very grateful that it has continued to receive the support that it has in these continuing difficult economic times.

To the Scientific Committee and their longstanding and dedicated Chairperson, Associate Professor Pat Cragg for the many long hours spent on the assessment and advice on grant applications to ensure a transparent and robust process which ensures the Foundation's funds are used in the best possible way.

Thank you; your efforts are really appreciated. Without you all we would not be able to achieve the object of the Foundation, "The Furtherance of Medical Research in Otago".

To all Council Members, and our Patron, Emeritus Professor Gil Barbezat, for your contribution and support, my sincere thanks for your continued interest in, and work done, for the Foundation.

To my fellow Investment Sub-Committee members, Mike Horne, Ron Lewis/Michael Milne and Judy Bevin for their wise counsel, advice and time so willingly given to serve on this Sub-Committee, I thank you most sincerely.

To the Deloitte team of Mike Horne, Megan Vintiner, Trudy Corbett and Josh Cuming for continuing to provide very professional, friendly and efficient administration services for the Foundation. Mike and Megan are the face of Deloitte for the Council, while Trudy and Josh are the backroom team, ensuring that the Foundation's day to day requirements are attended to in a timely and professional manner and your efforts are very much appreciated.

As noted in last year's report, 2017 marks an important milestone for the Foundation as it was 50 years ago, on the 14th March 1967, that a preliminary meeting was held to discuss the "Proposed Otago Medical Research Foundation".

The 1st Council meeting of the Foundation was held in September 1967 and this 50-year milestone will be recognised by the Foundation hosting a movie night this September. The 50th anniversary of the 1st Grant round will be observed at the appropriate time in 2018.

On behalf of the Council

Ken Dempster

Chairperson

FUNDS GIVEN

OF SCHOLARSHIPS, GRANTS, TRUST GRANTS, LAURENSON GRANTS AND JACK THOMSON GRANTS

Summer Scholarships

Kidney $5,000

Heart $17,000

Health $4,000

Drug Development $12,000

Cancer $8,000

Pregnancy $4,000

DNA $4,000

Neuro /Brain $12,000

Blood $4,000

Immune System $8,000

Gut Health $4,000

Cells $8,000

Nutrition $4,000

Annual Grants

CANCER $54,923

GUT HEALTH $32,047

NEURO /BRAIN $20,000

IMMUNE SYSTEM $34,994

Otago Community Trust

NEURO/BRAIN $38,614

CANCER $27,318

Laurenson

CANCER $14,372

BACTERIA RESISTANCE $26,300

HEART $51,150

Jack Thomson

ARTHRITIS $32,533

OSTEO-ARTHRITIS $27,000

GOUT $30,440

FOUNDATION FUNDING FUELLING RESEARCH INTO REDUCING DIABETES RISKS

The Foundation congratulates Summer Research Student Erin McKergow on her 2016 summer project work being accepted for publication in the journal Acta Diabetologica, which publishes experimental and clinical research on diabetes mellitus.

Erin's scholarship was established using funds granted by the Kelliher Charitable Trust.

Type 1 diabetes is a lifelong condition where the body cannot produce enough insulin, the hormone which controls blood sugar (glucose) levels. Without insulin, glucose remains in the blood and long-term, the high levels cause damage to eyes, kidneys, blood vessels, heart and feet. The main aim of diabetes treatment is to keep glucose levels as close to normal as possible, reducing both the immediate risk from high or low glucose levels and long term damage.

Advances in insulin pump technology have led to an increase in pump use and some patients find pumps more convenient than insulin injections, allowing them to better control their blood glucose levels.

During her summer research project, Erin, under the supervision of Dr Lianne Parkin and Dr Ben Wheeler (at the University of Otago's Department of Preventive & Social Medicine and Department of Medicine respectively) investigated the pattern of insulin pump use in New Zealand. PHARMAC has funded pumps since 2012 and Erin carried out a nationwide study to investigate the number of type 1 diabetics using these. She found there are marked demographic and regional differences in insulin pump use.

Significantly higher proportions of females, younger patients, New Zealand Europeans, and patients living in socio-economically advantaged regions used pumps in much larger numbers than Māori, Pacific and Asian patients. The ethnic and socio-economic disparities Erin discovered are concerning with patients with lower use more likely to have poor blood glucose level control and be at greater risk of long-term complications of damage.

The ethnic and socio-economic disparities Erin discovered are concerning with patients with lower use more likely to have poor blood glucose level control and be at greater risk of long-term complications of damage.

Erin's research and upcoming publication will be vital in helping doctors involved in diabetes treatment understand the issues surrounding insulin pump use in New Zealand. This information is essential to help ensure that all patients have an equal opportunity to benefit from intensive diabetes management plans.

UNDER THE MICROSCOPE

Summer Scholarships 2016/17

The Foundation awarded a total of 23 Scholarships for Summer 2016/17. Students carry out ten weeks of research, a few of these fascinating studies have been hand-picked for stories below:

Vaccines for Cancer: Could therapeutic vaccines solve our cancer treatment woes?

By Douglas Gaskarth

New research at Otago University Pathology Department suggests training our immune systems to fight cancer through therapeutic vaccination could become an effective treatment in near future.

By linking components of cancers, which aren't very stimulating to the immune system, to compounds known to activate a strong immune response, researchers aim to develop a therapeutic vaccine which may act to clear existing tumours from the body and prevent their reoccurrence.

Immune based therapies like therapeutic vaccination have become a 'hot topic' in the treatment of cancer in recent years. There are smaller number of side effects compared to other treatments such as chemotherapy, and the production immune 'memory' which prevents the cancer returning.

Although early days, therapeutic vaccines may solve toxicity problems associated with other treatments and become a promising new strategy to fight cancer using our bodies natural defence system.

In our bodies, we have cells called antigen presenting cells. These constantly sample parts from our body to determine if they are normal and healthy, or abnormal and dangerous.

Dangerous parts are presented by antigen presenting cells to effector cells. Activating them to hunt down cells producing these dangerous parts and kill them.

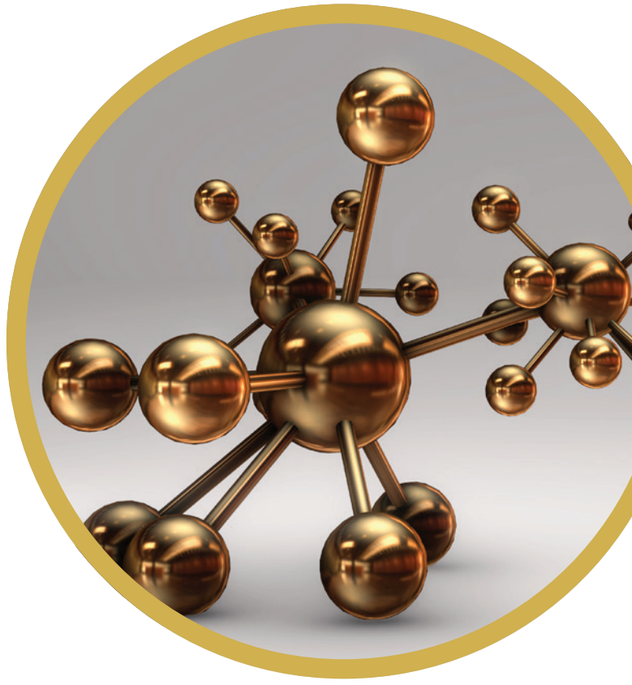
Cancer parts, although abnormal, are not presented in large numbers by antigen presenting cells. One way we can increase the amount of presentation is by linking these parts to other compounds known to strongly activate antigen presenting cells. This combination is called an immune conjugate, which can be added to the body as a vaccine.

Immune conjugates allow cancer parts to be presented in greater numbers to effector cells. This leads to more activation and therefore more cancer killing.

A New Golden Era: Could Gold save lives?

By Natalie Lagesse

Gold centred molecules could be powerful new antibiotics, providing an answer to rising antimicrobial resistance and preventing a plague filled post-antibiotic era.



Antibiotic resistance is on the rise. When antibiotic courses are not properly followed, surviving bacteria mutate - what doesn't kill them, truly makes them stronger. These new 'super bugs' are becoming resistant to more and more of the antibiotics which doctors hold in their bacteria slaying arsenal. This resistance will lead to bacterial infection becoming a large threat to the survival of the human race.

Past research, and even historical practices, have shown that molecules containing certain metals, including gold, have the potential to be excellent antimicrobial agents. They are not biologically common, so will be unfamiliar to bacteria, and often work in new ways to kill bacteria, giving hope for a plague free future. The family of Gold containing molecules I am studying have shown good antimicrobial activity, however, changes in the peripheral structure of the molecules could lead to even better antimicrobial activity. Bacterial testing against super bugs will be the final step to discover if this family of gold molecules can save lives.

Discovering new antimicrobial agents with novel modes of action is the only way to prevent the onset of a post-antibiotic era.

Too Sweet to Beat

By Lizelle Borges

What is the main cause of death for diabetics? They can suffer a range of problems, but heart disease is number one.

For the heart to contract it requires calcium. Which gets released from a store inside the cell following an electrical trigger. So, how does the heart function differently in diabetes? It is questions like this which form the basis of my research. Looking at the microscopic level gives us a better indication of the changes occurring in diseased heart tissue. Firstly, diabetes is a disorder resulting in elevated blood glucose levels. Potentially, this may contribute to promoting the spontaneous release of calcium without the initial electrical trigger. Therefore, causing an abnormal contraction and irregular heartbeat, which in diabetics, can lead to fatal outcomes. Further research in this field can provide a better understanding of the main causes of diabetic heart disease.

Heart disease is the major cause of death for diabetics. For the heart to contract, it requires calcium ions. However, it can also be released spontaneously which can trigger arrhythmias.

In a healthy heart, everything is working together in a coordinated and efficient manner. In a diabetic heart, things aren't working so well. In a healthy heart, calcium releases activated bioelectrical signals. Calcium binds to a regulartory protein which then activates the contractile unit resulting in contraction of the heart. In a diabteteic heart, calcium release is spontaneous, without requiring the electrical signal. This ultimately results in impaired heart function in diabetes.

REPORT FROM THE DIRECTOR OF DEVELOPMENT

In this, my final report as Director of Development, I am delighted to salute another very fine year.

Membership of and support for the various events on offer has increased for a seventh successive year, patronage from trust's and charities, and business houses and individuals remains high, there is a growing awareness of the Foundation's work and – best of all – the value of the research projects and scholarships launched each year continues to have a positive impact on the health of millions of people around the world.

More than $4.5 million dollars has been attracted since the Foundation trod a public funding pathway for the first time in early-2010 and, despite it being an extremely tough and highly-competitive fundraising environment, the signs for a continuation of that largesse look promising.

My thanks again to all of our members, supporters and friends for their faith in what our researchers are achieving and their tangible backing of that belief.

The Foundation's ambitions, achievements and activities are listed elsewhere in this annual report but I again recognise the generosity of each and every one of those financial backers. Without your support, the Foundation would simply not exist, nor would the benefits of the research established flow out through the global community.

In stepping aside from the daily administration of the Foundation to focus solely on the major events, I wish the new Director Susan Sims every good fortune. Susan's background is one which will serve the Foundation well in the years ahead and I commend her abilities to you.

More than $4.5 million dollars has been attracted since the Foundation trod a public funding pathway for the first time in early-2010

Steve Davie
Director of Development
(January 2010 to May 2017)

FUNDS RAISED

BENEFACTORS AND DONORS

Dr Ailsa Goulding
Dr Clive and Mrs J Trotman
Calvert Broad Charitable Trust
Crowe Horwath
Cutlers Limited
Deloitte
Dunedin Venues
'Friends of the Foundation'
Healthcare Otago Charitable Trust
Howard & Jane Fraser
Jack Thomson Estate
JAD Iverach Memorial Fund
Jan Warburton
JN Lemon Charitable Trust
Justin & Eterei Stonelake
Kelliher Charitable Trust
Kingston Sedgfield Charitable Trust
Lion Foundation
Lions Club of Dunedin South
Lisa McNaughton
McGlashan Challenge
MM & JH Hughes Family Trust
OceanaGold NZ Ltd
Otago Community Trust
Otago Diabetes Research Trust
Otago Rugby Football Union (Heritage Day)
Otago Service Clubs Medical Trust
Paper Plus Dunedin
Payless Energy
Phil Chronican
PricewaterhouseCoopers
Rabia Siddique (Courage Under Fire)
RD Petroleum
Southern Trust
Southern Victorian Charitable Trust
Specsavers Dunedin
St Joan's Trust
The Werribee Trust

Figures produced are net values from the End of Year Financial Report to March 31 2017.

EVENTS

A Night to Remember 2017

From the sublime to … almost the ridiculous!

The Otago Medical Research Foundation's fifth annual dinner offered entertainment at both ends of the spectrum and the 460-seat sell-out crowd were royally treated.

We were able to celebrate the world's greatest rowing combination – the New Zealand men's pair of Hamish Bond and Eric Murray who were unbeaten since the beginning of 2009. Over that eight-year, 69-race domination, Bond and Murray won two Olympic gold medals, six world championships and 16 World Cup titles. For good measure, they also raced to the world's fastest men's pairs time of 6 minutes 8.50 seconds.

A marvelous combination on the water but chalk and cheese off it, their presence on stage made for terrific entertainment, emotion and story-telling (many of the responses to a 40-minute Q & A had never been heard before) and the audience lapped it up. Their presence, on reflection, was made even more special with Murray retiring shortly afterwards, ending a spectacular partnership for what became known internationally as the Kiwi Pair.

After another fabulous meal provided by Compass Catering, Mick Colliss, the vice-captain of the poorly-performed Australian Sudoku team which finished a distant last at the 2008 world championship in India, had guests in raptures as he told the story of team trials, selection and competition. It was no surprise the Aussies finished dead last in Goa … three of the four players never having previously played the game! The story of the Numbats, as they were known, had us rolling in the aisles.

Almost $90,000 was raised through the dinner by way of sponsorship, ticket sales, auction, raffle and donations with these funds going directly to the Foundation's work of establishing grass-roots, catalyst research projects and scholarships in Dunedin.

Our band the 8-piece Studio 54, as is now tradition at *A Night to Remember*, put together a non-stop two-hour dance set.

The Foundation is indebted to everyone who played a part in the successful hosting of what is now regarded as the best night of its type in Dunedin – and our thanks go to our sponsors: Oyster Executive Recruitment (naming rights'), Vero Liability and OceanaGold NZ (Associate), and Forsyth Barr, Armstrong Presti ge, NZI, Crombie Lockwood, Misha's Vineyard, Metro Realty and Liquorland Leith Street (Supporting Partners). We also acknowledge Compass Catering, Strawberry Sound, The Video Factory, Dunedin Venues, auctioneer Rob Fowler and Forsyth Barr for their generosity and enthusiasm with production and presentation requirements.

Our thanks also to those who donated auction items – Felton Road, Restaurant Associates, Hayden Paddon, Emerson's Brewery, Scenic Hotels, Armstrong Prestige, Michelle Chalklin-Sinclair, Cardrona Snow Farm, Cardrona Distillery, Real Journeys, Highland Helicopters and the following vineyards … Weaver Estate, Two Degrees, Aurum Wines, Gate 20 Two, Two Sisters, Peregrine, Amisfield, Black Quail Estate, Bannock Brae and Maori Point.

And a number of businesses and individuals were very generous in offering prizes for the high-class raffle and we recognise Nova, Rialto Cinemas Dunedin, inGOLF, Klone Hair, Preens Drycleaners, MAHER Shoes, Farmer's Dunedin, Suits on Wall St and Bloke for their support.

A Night to Remember 2017 was again just that, the successful outcome being the result of a significant team effort.

2016 Golf Tournament

After a foggy start the skies cleared and the seventh annual Foundation golf tournament was played in perfect conditions on the St Clair course.

Staged again in association with OceanaGold NZ, the tournament attracted 25 teams and was played under ambrose rules – with a twist. After each player drove from the tee, a dice was tossed to determine whose drive was taken. The resulting mirth, relief or angst was a source of much story-telling post-play.

Just over $18,000 was raised on the day with these funds to be directed towards the establishment of a research grant in May this year.

More than $120,000 has been raised at the seven tournaments staged so far with a number of the far-reaching research projects launched as a result. A number are already proving of significant value, either in their own right or in leading to further investigation.

Supporting the terrific annual OceanaGold NZ commitment were our hole sponsors on the day – Armstrong Prestige, Unichem Mornington Pharmacy/RPB Law, Palmers Mechanical, Forsyth Barr, the Tarn Group, Mr Patrick Dawes, Deloitte, Southern Colour Print, Craigs Investment Partners, HSBC, Dr Alan Wright, McDonald's Dunedin, Polson Higgs and Payless Energy. The Foundation acknowledges the support of these corporate and individual supporters.

Our prize and refreshment sponsors are also warmly recognised – our thanks to Dr Brian McMahon, Dr Jenny McMahon, Maher Shoes, Aravin Estate, Valspar New Zealand, Rialto Cinemas Dunedin, Rockburn Wines, Gardens New World, Suits on Wall Street, House of Travel Dunedin, Armstrong Prestige, Perseverance Estate, Forbury Park Trotting Club, Dunedin Casino, University Book Shop, Stirling Sports Dunedin, Jack's Point, Mitchell's Tavern, Stu McCullum/Wilson Staff Golf, Mike Bird and Jonathan's Photo Warehouse.

The day's results were:

Closest to the pin – 4th: Troy Ferguson; 7th: Callum Stringer; 13th: Andrew Cessford; 16th: Kieran Gavegan. Closest to the pin with the second shot on the 15th: Peter Young.

Team results:

1st: playing off a handicap of 4.375, net score of 54.625 – Whatsoever Ltd

2nd: 4.875, 55.125, Palmers Mechanical

3rd: 3, 56, Forsyth Barr

4th: 8.875, 56.125, Southern Colour Print

5th: 10.25, 56.75, Armstrong Prestige

6th: 8.875, 58.125, Lab Supply Ltd

7th: 10.375, 58.625, Eion Willis

8th: 3.25, 58.75, GJ Gardner Homes Dunedin

9th: 8.125, 58.875, Dr Alan Wright

10th: 8, 59, StoreSafe

11th: 7.625, 59.375, Otago Medical Research Foundation

OMRF CLUB OTAGO LUNCH SERIES

Established in early-2012, Club Otago continues to bring together the very best in speakers, camaraderie and charity.

Club Otago has been enthusiastically embraced by the region's corporate sector and individual enthusiasts alike and is a high profile component of the Foundation's calendar of events.

Four lunches are hosted each year featuring the topical speakers of the moment. Over the years high caliber speakers have included:

Tyler Hamilton – Former US Postal Cyclist

Sir Jerry Mateparae – Governor-General of NZ

Dame Susan Devoy – Race Relations Commissioner of NZ

Peter FitzSimons – Australian author and columnist

All funds raised are directed towards the Foundation and its on-going mission of identifying and nurturing world class medical research.

JOIN

To join Club Otago, simply go to our website: www.omrf.org.nz/club-otago/ and fill out the form or contact Susan Sims at susan.sims@omrf.org.nz

Membership of Club Otago is open to anyone.

Membership fees cost as little as $250 per year, of which all goes towards funding medical research.

Patrons

Armstrong PRESTIGE · Oyster. EXECUTIVE RECRUITMENT · Fulton Hogan · DUNEDIN VENUES · ANZ · MERCY HOSPITAL · pwc

Senior Fellow

Otago Polytechnic

Fellow

Allied Press
Carpet Court Dunedin
Deloitte
McMahon Investments
NZME
Ross & Bev Middlemass
RD Petroleum
Stu Stevenson

Associate Fellow

Asteron Life
Brian Stevenson
Forsyth Barr
Harvie Green Wyatt
HSBC
Immersion Marketing
Jenepher Glover
Living Corporation
Markhams Clarke Craw
Otago Cricket
Sassenachs RFC
Seperex Nutritionals
SF Waller Family Trust

Individuals

Brenda Allum (Sports Medicine New Zealand)
Paula & Peter Anstey
Judy Bevin (J. Bevin Ltd)
Hudson Biggs (Accounting & Finance)
Adam Binns (Adam Binns Commercial Ltd)
Michael Bird (Store Safe Ltd)
Dr Kay Bradford
Jono Bredin (Keogh McCormack)
John & Jacqui Brenssell (Paper Plus Dunedin)
Barbara Bridger (Otago Community Trust)
Dave Callon (ShareNZ)
Andrew Campbell (Valspar)
Andrew Carmody (helloworld)
Russell Cassidy
Hannah Catchpole (Otago Racing Club)
Grant Chirnside (Southern Realty)
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Steve Cogger (Black Rock Consulting Ltd)
Dean Collins (Colliers International)
Keith Cooper (Miller Creative Group)
Fred Daniel
Malcolm Dore (Magoo Auto Dunedin)
Noel Davie (Strategic Pay)
Malcom Farry (Farry Group)
Dr Norman and Mrs Barbara Fitzgerald (NW Fitzgerald Family Trust)
John Freeland (Aon, Mosgiel)
Adam Gain (Metro Realty)
Donna Gale (NZI)
Ross Gamble (Roslyn Storage)
Steve & Tricia Gillies (Gillies Financial)
Ray Grubb (Morgan GR Tourism)
Mark Hammer (ASB Commercial)
Bill Haydon (Roman Catholic Diocese of Dunedin)
Graham Helm (Crombie Lockwood)
Ian Hogg (ANZ Bank – Commercial)
Murray Hughes (Aotea Electric Group)
Sharon Hyndman (Metro Realty)
Dr Rod Keillor (Keillor Ophthalmology)
Yash Khan (Octagon Dental Suite)
Adam La Hood (Cook Brothers Construction)
Emily Lam (Otago Orthodontics)
Martyn Ballantyne and John Larsen (Suits on Wall Street)
Neil & Jamie Lyons (Signature Property Ltd)
Iain Mackay (Miller Creative Group)
Craig McGregor
Stuart McLauchlan (GS McLauchlan & Co)
Andy McLean (Yellow Pages Group)
Rod McMeeken (The Brothers Hotel)
Mr Will McMillan (McMillan Medical Specialists)
Dave McPhedran (YBT)
Michael Milne (Craigs Investment Partners)
Nadene Moore (International Freight Logistics)
Phil Moore (Westpac Business Banking)
Simon Parker (Parker Warburton Team Architecture)
Mike Pearce (Strawberry Sound)
Alan & Denise Preston (Bedpost Dunedin)
Russell Quin (Quintessential Financial Services)
Richard Roberts (Dunedin Airport)
Sergio Salis (London Street Specialists)
Sarah Saunderson-Warner (Barrister & Solicitor)
Assoc Prof Michael Schultz (Gastroenterology Otago Ltd)
Carl Spruyt (10X Business Coaching)
Tracy Stevenson (Webb Farry Lawyers)
Justin & Eterei Stonelake (McDonalds Dunedin)
Dr Paul Templer (Sandman Anaesthetic Services)
Nigel Thrush (Specsavers Dunedin)
Barry Timmings (Timmings Partners)
Chris Timms (Craigs Investment Partners)
Michael Turner (Polson Higgs)
Sherman Weatherall (Agility Logistics)
Tom West (Tom West Risk Advisors)
John White (Telfer Electrical Otago Ltd)
Janine Young

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Dean Dunedin School of Medicine
ex-officio

Assoc Prof P A Cragg
Chairperson of Scientific Committee
ex-officio

Mr M C Horne
Deloitte (Secretaries)
ex-officio

Prof A Van Rij
Otago University Faculty of Medicine

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N.Z. Medical Association (Otago Division)

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Co-opted

Assoc Prof G Jones
Co-opted

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Co-opted

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Otago District Health Board

Prof J Highton
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Mr R Bunton (to 27 September 2016)
Otago District Health Board

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Elected by Members of the Foundation

Mr K G Dempster
Elected by Members of the Foundation

Mr R P Lewis
Elected by Members of the Foundation

Dr J McMahon MBE (to 27 September 2016)
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Ms S Saunderson-Warner (to 6 December 2016)
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Mr M Milne (from 6 December 2016)
Co-opted

Dr L Wise (from 7 March 2017)
President of the Otago Medical School of Research Society

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Assoc Prof P A Cragg - Deputy Chairperson

Deloitte representative - Secretary/Treasurer

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Assoc Prof P A Cragg - Chairperson

Physiology Department, Otago Medical School

DIRECTOR OF DEVELOPMENT

Mr Steve Davie (to May 2017)

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HONORARY SOLICITOR

Mr J Anderson (Gallaway Cook Allan)

AUDITORS

Crowe Horwath

PATRON

Emeritus Professor Gil Barbezat

BEHIND THE FOUNDATION

The thing that Associate Professor Greg Jones likes most about the Otago Medical Research Foundation is its role in incubating research.

Greg is the deputy chair of the Foundation's Scientific Committee, which is responsible for deciding on funding application recipients for two grant rounds per year, as well as selecting summer studentships.

He says it's immensely satisfying to know that what they do makes a difference to the region's researchers and to the community.

"I like that we support such a wide range of research, from basic to applied – everything from cellular processes to patient experiences and quality of life studies."

He says it's particularly important to recognise the vital role the Foundation has in investing in promising ideas.

The Foundation helps to fund medical research projects and scholarships which are highly novel and scientifically worthy, but due to their early exploratory nature don't always attract the interest of larger funding agencies.

"Our investment has therefore been the impetus for some worthy research. It's great to see some of these projects blossom into major research programmes that attract national funding, often into the millions of dollars, many of which may not have gotten off the ground without this type of incubator."

It's also rewarding to be in a position of investing in people.

"It's unfailingly impressive to see what research outcomes the summer studentship recipients can achieve in 10 weeks. But not only are we funding good research, I love that we are seeding a passion for science - the opportunity lights a spark for those who go on to either begin a career in research, or to incorporate research into a clinician role. It's a very good investment."

Some esteemed alumni have gone on to become global leaders in their medical fields.

"The projects we have funded have answered very interesting research questions, but just as often, they raise even more questions, as is the nature of science. Research never stops; the Foundation is integral to the process of encouraging researchers to keep asking."

Greg has spent 15 years on a hard-working committee that puts in a lot of voluntary time. He says allocating the funding is always tough, given the exceptional quality of the many research proposals put forward, but the committee is committed to being both fair and flexible.

Greg is a researcher in the fields of vascular biology and genetics with the University of Otago Department of Surgical Sciences (DSM). His research group works with patients to assess diseases, such as aortic aneurysm and heart disease, and has research projects looking at population genetics, cardiovascular disease biomarkers, and vascular connective tissue biology.

Greg's team is currently working on a pioneering new system of aneurysm screening, which has the potential to globally revolutionise the identification and management of this condition.

LIST OF MEMBERS

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Mr G T Adams
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SCIENTIFIC COMMITTEE REPORT

1 September 2016 to 30 June 2017

1. MEMBERSHIP

Chair: Associate Professor Pat Cragg
(Nominee of the Otago School of Medical Sciences)

Deputy Chair: Associate Professor Greg Jones
(Co-opted)

Dr Andrew Bahn
(Nominee Otago Medical School Research Society)

Dr Chris Brown
(Co-opted)

Dr Cathy Chapple
(2017 Co-opted)

Dr Heather Cunliffe
(Co-opted)

Dr Peter Gootjes
(Nominee Otago Branch of the NZ Medical Association)

Associate Professor Bob Hancox
(Nominee Dunedin School of Medicine)

Dr Nick Heng
(Co-opted)

Associate Professor Keith Ireton
(2017 Co-opted)

Associate Professor Gill Johnson
(Co-opted)

Dr Joanna Kirman
(Co-opted)

Associate Professor Ivan Sammut
(Co-opted)

Dr Damian Scarf
(Co-opted)

Dr Jon Schemmell
(Nominee Otago Medical School Research Society)

Associate Professor Joel Tyndall
(2016 President Otago Medical School Research Society)

Professor Rob Walker
(Co-opted)

Dr Lyn Wise
(2017 President Otago Medical School Research Society)

The Scientific Committee is primarily concerned with adjudicating on applications for Research Grants and on applications from students for Summer Research Scholarships. To cover the breadth of topics submitted, the committee is relatively large to ensure it has representatives from all the major sub-disciplines of medical research.

At the end of 2016 there were four retirements from the committee: Dr Peter Gootjies, Associate Professor Gill Johnson, Dr Joanna Kirkman and Associate Joel Tyndall who joined the committee, respectively, in March 1999, 2015, mid-2014 and mid-2013. All have provided excellent input to our deliberations and in particular we thank Dr Peter Gootjies who has represented the Otago Branch of the NZ Medical Association for 17 years. For 2017 we welcome Dr Cathy Chapple and Associate Professor Keith Ireton as co-opted members from the University of Otago representing the School of Physiotherapy and Department of Microbiology & Immunology, respectively, and Dr Lyn Wise as the incoming President of the Otago Medical School Research Society.

Note: Most, but not all research projects, have protocols that require approval by the appropriate Ethics or Safety Committee prior to commencement of the research. Agreement by the Foundation to fund research projects is thus subject to receipt by the Chair of the Scientific Committee of a letter from the University of Otago's Animal Ethics Committee, Human Ethics Committee or Human Ethics Committee (Health) (or the Ethics Committee of a Health Funding Authority) indicating that the research has received full ethical approval. Work involving genetically modified organisms requires evidence of approval from ERMA or from the University of Otago's Institutional Biological Safety Committee.

The scientific activities of the Foundation (advertising of up-coming grants and listings of awards) can be found on the following web site http://www.omrf.org.nz

2. SUMMER RESEARCH SCHOLARSHIPS 2016/2017

One hundred and four applications (compared with 110 the previous year) for an OMRF summer research scholarship were received from the University of Otago in late August 2016, of which 23 (cf 28 last year) were recommended for funding by the OMRF (and at least 75 of the other applicants gained scholarships from other funding bodies or the Division of Health Sciences and its Schools or departments). Of the 23 students funded by the OMRF, two were studying biomedical science, one dentistry, ten medicine, nine science and one applied science. It should be noted that the ten-week summer research is not part of the study required in a student's tertiary qualification and any data obtained during the summer research cannot contribute to the dissertation or thesis of such a qualification.

Each scholarship was worth $4,000 except for the two students with the highest scores who were awarded named Summer Research Scholarships ($5,000) – named in honour of the late Allan Wilkinson and the late Emeritus Professor Garth McQueen. Allan was Secretary of the Foundation from its inception in 1967 until his retirement in 1993 and Garth was a foundation member of the Foundation and one of the instigators of the formation of the Foundation's Auxiliary. One of the projects was funded from the Foundation's Iverach Fund, another was administered by the OMRF but sponsored by the Otago Diabetes Research Trust and two were funded by existing OMRF funds.

Due to the continuing sponsorship drive of the OMRF, all the other 17 OMRF scholarships were funded by: Ailsa Goulding, Sharon Hyndman, Crowe Horwath, Deloitte, Healthcare Otago Charitable Trust, Heritage Day, Hughes Family Trust, Jan Warburton, Kingston Sedgfield Charitable Trust, Lions Club of Dunedin South, Otago Service Clubs Medical Trust, Rabia Siddique, Southern Victorian Charitable Trust (4) and Stonelake. The involvement of Otago commercial companies and the Otago community for a sixth year in supporting summer research by tertiary students is very much appreciated.

All scholars returned good to excellent reports by the end of February 2016. The **Renshaw Prize** ($250) for the best report was awarded this year to **Sashika Samaranayaka**, who worked under the guidance of Professor Rob Walker of the Department of Medicine. Three students also received commendations.

The following is a list of the summer scholars and summaries of the projects undertaken – additional information on these projects can be obtained from the Chair of the OMRF Scientific Committee or from the supervisor concerned.

SASHIKA SAMARANAYAKA (Professor Robert Walker, Department of Medicine, Dunedin School of Medicine)

Title: The effect of multiple medication usage on hospital admissions and death in older kidney disease patients

(Sharon Hyndman Scholar)

Renshaw Prize Winner for the best OMRF summer research scholar report

It is unknown whether multiple medications (polypharmacy) are beneficial or harmful. Even less is known about the risk of multiple medications in patients with kidney disease. This study investigated what effect polypharmacy had on hospital admissions and death in a group of older kidney disease patients. This study utilised data collected in a previous study on the medications use, hospitalisations and death of older New Zealand kidney disease patients over a three-year period. Increasing numbers of medications were associated with worse health outcomes. Each additional medication increased the risk of death by 8% and showed a tendancy to increase hospitalisations. Each 'medication group' increased the risk of death by 11% and had a similar effect with hospitalisation. The study identified specific medication groups responsible for these associations. In conclusion there is an association between increased medication use and unfavorable health outcomes.

HAMISH AITKEN-BUCK (Dr Regis Lamberts, Department of Physiology, School of Biomedical Sciences)

Title: Newly discovered protein has no effect on relaxation of cardiac muscle, despite its key role in relaxation of skeletal muscle

(Garth McQueen Scholar)

Commendation for an excellent summer scholarship report

Relaxation of cardiac muscle is essential for adequate heart function, without it the efficiency of the heart as a blood pump is reduced. Previous research has shown that a newly discovered protein, named myoregulin, has a significant role in inhibiting skeletal muscle relaxation. Therefore, this study aimed to determine the function of myoregulin in cardiac muscle and if it may influence relaxation of the heart. To do this, we exposed isolated heart preparations to myoregulin and measured key relaxation parameters. Contrary to our hypothesis, we found that myoregulin did not have any effect on relaxation of isolated rat heart preparations and therefore does not have a significant role in regulating the relaxation of the heart. Despite this, the continued discovery of new proteins that influence muscle function, whether cardiac or skeletal muscle, provides a means of understanding how these muscles work and, in turn, how these proteins may influence disease development.

LIZELE BORGES (Dr Pete Jones, Department of Physiology, School of Biomedical Sciences)

Title: Structural changes to cardiac proteins may underlie arrhythmias

(Kingston Sedgfield Charitable Trust Scholar)

Heart disease is the major cause of death for diabetics. For the heart to contract, it requires calcium ions, Ca^{2+}, which is released from Ryanodine Receptors (RyR2) inside the cell following an electrical trigger and mediates contraction. However, it can also be released spontaneously which can trigger arrhythmias. In diabetes elevated blood glucose increases O-GlcNAcylation levels. This involves the attachment of sugar to proteins, and may potentially contribute to protein structural and functional impairment. The aim of this project was to determine if O-GlcNAcylation can alter the activity of RyR2. To observe this, molecular assays and Ca^{2+} imaging were undertaken of a cell line similar to heart cells. Our results showed inhibition of O-GlcNAcylation to have no increased occurrence of un-triggered Ca^{2+} release in HEK293 cells. However, promoting O-GlcNAcylation resulted in an increased occurrence of these events. This suggests that RyR2 is O-GlcNAcylated and that it increases the level of spontaneous Ca^{2+} release and may help explain why diabetics have more arrhythmias.

EMILIE BUTTERFIELD (Dr Richard Egan & Dr Kate Morgaine, Department of Preventative & Social Medicine, Dunedin School of Medicine)

Title: Health promotion workforce interests and needs survey

(Heritage Day Scholar)

Health promotion values the competencies of advocacy, enablement and mediation to develop population level interventions that target the environment of communities and individuals to improve health outcomes. This exploratory cross-sectional study has investigated the profile and professional development needs of the NZ health promotion workforce through the use of an online survey. The survey included questions around organisation, role, personal characteristics, values and competency application. Overall 499 self-identified health promoters responded from a diverse range of organisations and geographic locations. The study has shown that the workforce requires upskilling and support, however, cultural diversity, a high level of competence, and satisfaction with workplace and job was displayed. Overall, a positive depiction of the workforce was seen. The results of this study will help to guide future workforce development within NZ and will form the basis for future studies into the workforce.

DANNI CHEN (Dr Mikhail Keniya, Faculty of Dentistry)

Title: Identifying contact points for the development of next-generation antifungals

(Otago Medical Research Foundation Scholar)

Commendation for an excellent summer scholarship report

Invasive fungal infections are a major global health issue causing 1.5 million deaths annually. New drugs are urgently needed due to the increasing number of immunocompromised patients and resistance to existing antifungal medication. In this summer studentship project we analysed sites that potentially affect drug interactions within the essential fungal enzyme lanosterol 14α- demethylase. This enzyme is the target of azole drugs and is required for the production of ergosterol, an essential component of fungal cell membrane. In this project, mutations introduced in amino acid residues around the active site of the protein were used to assess their potential as drug targeting features. We found that these mutations increased susceptibility to certain antifungal drugs, and may aid in the development of next-generation antifungals.

ALEC CROSS (Professor Greg Cook, Department of Microbiology & Immunology, School of Biomedical Sciences)

Title: Understanding malate metabolism in mycobacteria

(Rabia Siddique Scholar)

Mycobacterium tuberculosis (TB) is a worldwide killer that claims 1.5 million lives each year. The drugs available to treat TB are running out, as resistance develops faster than we can kill the bacteria. Therefore, we need to develop new therapeutic agents to help those afflicted with TB. Energy generation was recently identified as a viable target for new antibiotics and this project specifically investigated the energy-generating malate:quinone oxidoreductase (MQO). Progress was made on creating several genetically modified strains that will be essential for understanding the role and druggability of MQO.

SAM FLAHERTY (Dr Anita Dunbar, Department of Biochemistry, School of Biomedical Sciences)

Title: Identifying cancer-associated mutations within the New Zealand population using high resolution melting analysis - developing new methods to improve the diagnosis of cancer

(Crowe Horwath Scholar)

Alterations in the DNA sequence of some genes can predispose individuals to a higher risk of developing various cancers. Other changes occur during cancer development and can be used for cancer diagnosis and as prognostic markers. This project used a modified version and existing method known as high resolution melting (HRM) analysis as a cheap and simple approach to identify these cancer-associated mutations. HRM analysis was used in this study to identify mutations in *BRCA1* and *PIK3CA* genes, both of which are involved in the development and progression of various cancers. The modified HRM demonstrated greater sensitivity than more traditional techniques for identifying mutations such as DNA sequencing. These results demonstrate the potential of this HRM technique as a cheap and simple way of identifying cancer-associated mutations.

ALICE FREEMAN (Associate Professor Christine Jasoni, Department of Anatomy, School of Biomedical Sciences)

Title: Epigenetic changes in the brains of offspring exposed to maternal obesity

(Ailsa Goulding Scholar)

Commendation for an excellent summer scholarship report

Maternal obesity during pregnancy is known to increase the risk of offspring obesity, however the mechanism underlying this is poorly understood. A region in the brain, called the arcuate nucleus is central to controlling how much food we eat. When a fetus undergoes gestation in an obese mother, key genes involved in development of the arcuate are reduced. It is thought that this is due to altered epigenetic (non-genetic influences on gene expression) control. This project aimed to investigate in mouse embros if *in utero* exposure to maternal obesity alters the distribution of a repressive epigenetic marker in the arcuate nucleus of the offspring. The repressive epigenetic marker was found to be increased in the arcuate nucleus of fetuses exposed to maternal obesity. This finding supports the idea that epigenetic changes may underlie the increased risk of obesity in offspring exposed to maternal obesity.

DOUGLAS GASKARTH

(Associate Professor Sarah Young, Department of Pathology, Dunedin School of Medicine, and Dr Greg Walker, School of Pharmacy))

Title: Linking skin cancer components to immune system activators, a new vaccine strategy to combat tumours

(Healthcare Otago Charitable Scholar)

Developing new strategies to combat cancer is a growing challenge for medical researchers worldwide. In recent years, therapies which stimulate the body's defences to fight cancer have had renewed interest. In this study, we aimed to produce two vaccine formulations which could be used to induce protective immunity in a mouse model by linking a known immune activator to the skin cancer component 'gp-100'. As well as this we aimed to confirm previous studies which used the model antigen 'OVA' also linked to the immune activator. By linking activator to cancer component, we aimed to provoke an effective immune response in mice against the cancer, leading to its removal by effector immune cells in the body. Our study successfully confirmed previous studies on the model antigen 'OVA' showing an enhanced anti-tumour immune response by the linked compound. This is to be repeated with the tumour antigen 'gp-100' in the future.

JOYCELYN HO (Associate Professor Russell Poulter, Department of Biochemistry, School of Biomedical Sciences)

Title: Gene editing of pathogenic bacteria

(Otago Medical Research Foundation Scholar)

Recent breakthroughs now enable researchers to precisely modify or edit specific DNA sequences in humans, plants and microorganisms. This project focused specifically on CRISPR/Cas9. The system acts as 'molecular scissors' that enable researchers to 'cut' and modify specific sequences of DNA. This research project looks to optimise CRISPR/Cas9 in pathogenic bacteria, in particular, pseudomonads. This included validating the specificity of the CRISPR/Cas9 system and investigating different methodologies of introducing the CRISPR/Cas9 system in pseudomonads. The experiments conducted was able to show that certain methods display considerable promise of successfully introducing CRISPR/Cas9 into pseudomonads. Successfully introducing the gene editing tool in the bacteria will give researchers the ability to modify specific sequences of DNA. This will be highly valuable in the investigation of virulence and antibiotic resistance in the human pathogen *Pseudomonas aeruginosa*.

NICOLA JONES (Dr Anna Wiles, Department of Pathology, Dunedin School of Medicine)

Title: A rapid diagnostic test to direct brain cancer treatment

(Deloitte Scholar)

Glioblastoma (GBM) is the most common, aggressive and lethal form of brain cancer worldwide. Survival times and responses to treatment vary widely, but all patients receive the same treatment. The molecular subtype of the GBM underlies this variability, however these subtypes currently cannot be distinguished by histopathology, a routine diagnostic lab method. This research project investigated the histopathological features of New Zealand GBM patient cases with the aim of establishing a rapid and inexpensive diagnostic tool that could allow for personalised treatment. A particular arrangement of cells known as pseudo-palisading was observed and found to be significantly associated with a molecular subtype of GBM. Additionally, it was discovered that pseudo-palisading is also associated with other specific features of GBM tumours. These findings have the potential to be useful in a diagnostic lab setting and could ultimately lead to improved health outcomes for patients with GBM.

NIGAAH KHAN (Dr Jeff Erickson, Department of Physiology, School of Biomedical Sciences)

Title: Effects of CaMKII on alpha adrenergic receptor activity in the diabetic heart

(Otago Diabetes Research Scholar)

Diabetes mellitus (DM) is a highly prevalent disease that can result in cardiovascular outcomes that may be fatal. CaMKII is a protein that shows increased activity in DM-associated cardiovascular outcomes and in response to α-adrenergic receptor (α-ADR) stimulus. It can increase and decrease activity of downstream proteins that are involved in the normal contraction and relaxation of the heart. Our aim was to determine whether an α-ADR stimulus in the presence or absence of CaMKII contributes to the cardiovascular pathology seen in DM. Our results in isolated rat hearts show that DM hearts have poor contractility basally, and CaMKII could be playing an inhibitory role on speed of contraction and relaxation in DM hearts, but helps increase speed of relaxation in non-DM (NDM) hearts. There is no difference in the expression of total or phosphorylated CaMKII between DM and NDM hearts and thus there may be another way by which CaMKII is being over-activated.

ANDREW KIM (Dr Tania Slatter, Department of Pathology, Dunedin School of Medicine)

Title: Do brain tumours metastases display two markers that could predict tumour behaviour?

(Southern Victorian Charitable Trust Scholar)

Tumours commonly spread to the brain and currently we are unable to predict which tumours will do so. Previous research carried out suggests that tumours which use a specific mechanism, the Alternative Lengthening Telomere (ALT), are more likely to spread. This study aimed to determine whether brain metastases express two ALT-associated mutations: alpha thalassemia/mental retardation syndrome x-linked (ATRX) and isocitrate dehydrogenase 1 (IDH1). 114 samples were tested for these markers using routine immunohistochemistry. This study found that ALT-associated mutations in brain tumour metastases were more common than ALT in primary tumours suggesting that brain tumour metastases are more likely to use the ALT mechanism. If this is true, it would make an easy transition into a clinical setting for an early indication of tumours likely to spread to the brain. However, further research is required to confirm if ALT-associated mutations can be a reliable surrogate for ALT.

HYUN KIM (Dr Ruth Napper, Department of Anatomy, School of Biomedical Sciences)

Title: A single alcohol binge during late fetal development results in cell death in the brain

(Southern Victorian Charitable Trust Scholar)

Individuals with fetal alcohol spectrum disorder (FASD) have mental and/or physical impairment. FASD results from alcohol exposure during pregnancy. The objective of this study was to investigate the effect of a single binge alcohol exposure on acute cell death in the cingulate cortex. The cingulate cortex is an important forebrain area involved in complex cognitive functions and any damage here will impact on learning. This study used a rat model, where a single binge of alcohol was given to rat pups on postnatal day 6 or 8, a period of rat brain development equivalent to brain development of the human fetus during the third trimester. The study quantified the dead cells, 12 hours after giving alcohol using a protocol called 'unbiased stereology'. The alcohol exposed animals had a significantly greater number of dying cells compared to those without the exposure. The finding highlights the importance of not drinking alcohol in pregnancy.

SEWOON KIM (Dr James Ussher, Department of Microbiology & Immunology, School of Biomedical Sciences)

Title: Characterisation of carbepenem resistance in a culture collection of invasive gram-negative isolates from Myanmar

(Southern Victorian Charitable Trust Scholar)

The purpose of this study was to isolate carbapenemase encoding plasmids to determine its molecular context in carbapenem resistant gram-negative bacteria isolated from patients in Myanmar. Conjugation experiments were conducted to obtain trans-conjugates along with electroporation to obtain trans-formants. Confirmation of these trans-conjugates and trans-formants were done by polymerase chain reaction (PCR). One trans-conjugate was obtained through the conjugation method and six trans-formants were obtained from all 6 isolates. These results provide the material for further analysing how the carbapenemase gene is transferred to different bacteria and hence provide useful information in reducing carbapenem resistance and furthermore combat the increasing problem of its dissemination.

NATALIE LAGESSE (Dr James Crowley, Department of Chemistry, Division of Sciences)

Title: A new golden age: Is gold the answer to the prevention of post antibiotic era?

(Southern Victorian Charitable Trust Scholar)

Discovering new antimicrobial agents with novel modes of action is the only way to prevent the onset of a post-antibiotic era. Synthesis of a family of gold(I) triazolylidenes which have been shown to have good antimicrobial activity has been completed. Conversion into cationic analogues via substitution of the chloride ligand for a triphenylphosphine ligand was also completed. Preliminary biological testing has shown antimicrobial activity against both methicillin-resistant *Staphylococcus aureus* (MRSA) and *Escherichia coli*, and stability against biological nucleophiles.

PINKY LAL (Dr Kirk Hamilton, Department of Physiology, School of Biomedical Sciences)

Title: Transport of the calcium-activated potassium channel (KCa3.1) to the cell membrane

(Otago Services Clubs Medical Trust Scholar)

It is understood KCa3.1 is synthesised within the cells of the human body. This channel is required to move from its synthesis station (Point A) to the membrane of the cell (Point B). In order for KCa3.1 to function, it must undergo correct movement to the membrane with the assistance of accessory proteins also called SNARE proteins. KCa3.1 is a channel, which is critical in nutrient and waste exchange in the body. Impairment to the movement of KCa3.1 can result in disease like ulcerative colitis (UC), a type of inflammatory bowel disease, and is commonly caused by the down regulation in KCa3.1 within the intestinal cells. This project focused on the interaction of the SNARE proteins with KCa3.1 in an epithelial cell line. An interaction was established for two of the three SNARE proteins with the channel. These data will enable future studies to focus on potential therapies and drugs for patients suffering from diseases such as UC.

GINNY NIEMI (Professor Sarah Hook, School of Pharmacy & Associate Professor Roslyn Kemp, Department of Microbiology & Immunology, School of Biomedical Sciences)

Title: Optimisation of a mouse model to study immune responses in colorectal cancer

(Stonelake Scholar)

Colorectal cancer (CRC) is one of the most common and deadly cancers in New Zealand. In order to research this disease, animal models, which give accurate data that can apply directly to humans, are required. In this study, a previous mouse model of CRC was improved to meet better animal welfare standards, surgical standards, and to be performed in a new animal facility. A new protocol was developed and tested. Major changes to the protocol, such as using gas anaesthetic and performing the surgery in sterile conditions, may affect the mouse immune system. Therefore, data from this modified

surgery will be compared to data from a previous surgery protocol to investigate any changes in immune response, which could affect results. This mouse model of CRC could be used in a variety of research, such as the testing of CRC treatments or preventative therapeutics.

JAMES NUTTALL (Associate Professor Michael Schultz, Department of Medicine, Dunedin School of Medicine)

Title: Quality of life for people with a stoma. Does this differ according to the underlying disease process?

(J.A. Iverach Scholar)

There are around 500 people in Dunedin, Central Otago and Southland who live with a bag on their tummy, where their bowel opens to empty its contents. It is called a stoma and it is formed most commonly in surgery for bowel cancer, but can be formed for other conditions such as inflammatory bowel disease. A survey was completed alongside an audit of the participant's medical records. The aim of the research was to identify how the underlying disease relates to quality of life with a stoma which had not been described in previous research. In this study, we found the quality of life was not significantly different in those who had bowel cancer compared to people with inflammatory bowel disease. The next step is to complete a more in-depth analysis of the relationship, considering the other quality of life scores and more of the clinical audit data.

JUSTINE PADDISON (Dr Nichola Swain, Department of Psychological Medicine, Dunedin School of Medicine)

Title: Patient-reported outcomes in those living with implantable cardiac devices

(Lions Club of Dunedin South Scholar)

Adjustment to living with an implanted cardiac device is complex, while most people respond well, others struggle. Collecting patient reported outcomes (PROs) will provide better understanding to the way people adjust to living with an implantable cardiac device. This studentship assessed the feasibility, and established a means, of prospectively collecting PROs in those living with implantable cardiac devices. Data collected will establish normal patterns of psychosocial adjustment, better identifying patients who will benefit from additional care. Analysis will identify common issues facing patients, informing rehabilitation support practices. Expectations and self-confidence in self-care will be investigated, as potential determinants of psychological distress and maladjustment. From this, the effectiveness of targeted interventions can be designed and tested. This study will inform which measures should be included when developing a nationwide PROs programme. Collecting PROs nationally will overcome District Health Board dependent variations in cardiac device populations.

JONATHON ROWE (Dr Adele Woolley, Department of Pathology, School of Biomedical Sciences)

Title: Investigating the link between YB-1 and cell migration in melanoma

(Hughes Family Trust Scholar)

Melanoma is considered one of the most aggressive human cancers. Cancers arise when cells acquire DNA mutations that result in uncontrolled cell growth. Some cells can then cease to proliferate and may become migratory. The Y-box-binding protein 1 (YB-1) has been implicated in both cell proliferation and migration. The aim of this research was to investigate two molecular sites on the YB-1 protein (S176 and S165) in four human melanoma cell lines, which may underpin the ability of melanoma cancer cells to transition from this proliferative to migratory phenotype. The results from this study suggest that two sites on YB-1 may be potential molecular targets for melanoma therapy for patients. In summary, YB-1 plays a critical role in melanoma progression and understanding this behaviour is critical to help prevent the spread of cancer.

HANNAH SIM (Dr Roland Broadbent, Department of Women's and Children's Health, Dunedin School of Medicine)

Title: Daily auditing of nutritional intake and prescriptions in the Neonatal Intensive Care Unit (NICU)

(Jan Warburton Scholar)

In very premature new-born infants nutritional intake is vitally important. For various practical reasons the prescribed nutrition cannot be given, so little is understood about the actual amounts of nutrition that is received by comparison. This project aimed to explore whether the aid of a nutritional calculator tool that displays information in graphical form would be useful in clinical practice. The tool was developed as part of the research, with an audit of nutritional intake being done for several patients. The tool also allowed for nutrient levels to be compared with established guidelines. Clinicians were surveyed after seeing it in use as to how they found it and whether they would use it. There was a positive response to the tool, with the potential for it to be implemented into everyday use, to provide better care for premature infants.

CHARLOTTE STEEL (Dr Stephanie Hughes, Department of Biochemistry, School of Biomedical Sciences)

Title: Investigating sleep disturbances in childhood Batten disease

(Allan Wilkinson Scholar)

Batten disease refers to a family of fatal inherited diseases that primarily affect children causing visual, cognitive, and motor problems. A genetic mutation causes one form of Batten disease that also occurs in mice. These mice exhibit reduced dendritic spine density in the cortex of the brain. However, spine density and morphology in the hippocampus, a region important to sleep, have not been investigated. Hippocampal degeneration may contribute to the sleep disturbances seen in Batten disease. Total sleep time, slow wave sleep time and delta wave power spectral density were quantified. Qualitative observations were made of hippocampal dendritic spines in mice with Batten disease as compared to healthy controls. The results of the study suggested a higher number of awakenings in mice with Batten disease, but no significant conclusions could be made as more animals are required for analysis.

3. RESEARCH GRANTS AWARDED

(A) ANNUAL GRANTS AND OTAGO COMMUNITY TRUST GRANTS

These one-year grants are for research concerned with human health and the scientific basis of medicine. In June 2016 there were 24 applications from the University of Otago (cf 33 the previous year) totalling $566,489 and eight of these were funded at a total expenditure of around $208,000 of which $70,000 was provided most generously by the Otago Community Trust. These grants commenced between August and October 2015 and are nearing completion with full reports due 3 months after the one-year grant ends. Progress as at the end of May 2017 is summarised below:

(i) ANNUAL GRANTS

Dr Mihnea Bostina, Dr Laura Burga (Department of Microbiology & Immunology) & **Professor Rhonda Rosengren** (Department of Pharmacology & Toxicology)

Targeting triple negative breast cancer stem cells with the oncolytic Seneca Valley virus – AG 354

Sponsored by Zonta Club of Metropolitan Dunedin (Women's Health)

Our research aims to develop Seneca Valley Virus (SVV), a powerful oncolytic agent, as a viable treatment for triple negative breast cancer (TNBC). Previously, we have identified tumour endothelial marker TEM8 as cellular receptor for SVV. During this project we intend to confirm the presence of TEM8 as a cancer stem cell marker by screening a panel of TNBC cell lines and evaluate the cancer killing potential of SVV. Our results to date, after screening a panel of eight cell lines, show that SVV has a cytotoxic effect on two TNBC cell lines. We isolated RNA from all the cell lines tested, and we performed a first round of quantitative RT-PCT, to assess the expression of TEM8 transcripts. We have set up the aldefluor assay and identified the percentages of stem cells in the cell lines sensitive to SVV infection.

Associate Professor Keith Ireton & Dr Mihnea Bostina (Department of Microbiology & Immunology)

High-resolution imaging of host cell exocytosis during infection by the bacterium Listeria – AG 355

Sponsored by JN Lemon Charitable Trust

Listeria monocytogenes is a food-borne bacterium that causes abortion or meningitis. In NZ and other developed nations, *Listeria* infections result in high rates of hospitalisation (~90%) and mortality (~20%). Critical for disease is the ability of *Listeria* to enter inside and replicate within human cells. How *Listeria* provokes cells into 'swallowing up' bacteria is not understood. In this proposal, we use high resolution imaging approaches to test the novel idea that *Listeria* subverts a normal host process called 'exocytosis' in order to gain entry into human cells. The OMRF project involves using Scanning Electron Microscopy (SEM) and also Correlative Light and Electron Microscopy (CLEM) to examine the role of a host process called exocytosis in remodelling of the plasma membrane of human cells during entry of *Listeria*. Thus far, we have found that nocodazole, a drug that inhibits exocytosis by blocking microtubule assembly, prevents plasma membrane remodelling that is normally induced by *Listeria*. In addition to microtubules, exocytosis also requires a class of proteins called SNAREs. In ongoing SEM studies, we are using RNA interference to test the role of host SNARE proteins in plasma membrane remodelling during entry of *Listeria*.

Associate Professor Alexander McLellan & Dr Sarah Saunderson (Department of Microbiology & Immunology)

Targeting cancer using modified T cells recognising a tumour coagulation antigen – AG 356

Sponsored by OceanaGold & Collective Donation for Cancer

The applicants set out to develop a new strategy for targeting solid tumours by exploiting the overexpression of a coagulation factor expressed on a number of highly invasive solid cancers. Many of these solid cancers are refractory to standard care of chemotherapeutic treatment. In this study, T cells were genetically modified using an antibody sequence against a tumour antigen. This sequence was then spliced to intracellular T cell signalling machinery to enable direct killing of tumour cells by modified T cells. This chimeric antigen receptor (CAR) recognised antigen in a highly sensitive and specific manner. A number of control experiments performed demonstrated the specificity of the interaction was confined to this particular tumour antigen. In addition, non-transfected control T cells, or T cells transfected with an irrelevant CAR, failed to react to the same tumour antigen. Since the construct is based on a clinically utilised CAR T cell designs, further modifications to the design will be minimal for translation into the clinic. However, the safety of the construct will need to be further tested in an animal model expressing the human tumour antigen.

Professor Warren Tate & Mrs Katie Peppercorn (Department of Biochemistry)

Is sAPPα protective against the toxicity of peptide Aβ in Alzheimer's disease? – AG 357

Sponsored by St Joan's Trust (Care of Elderly) & Southern Trust

We have established an assay for the key enzyme, BACE1, responsible for the production in the brain of the peptide amyloid beta, the causative agent of Late Onset or Sporadic Alzheimers disease. A neuroprotective brain protein, secreted amyloid precursor protein alpha (sAPPα), processed from the same parent protein as amyloid beta, is the core to our research in developing a therapeutic against the development of Alzheimers disease. Here we are investigating a report that this neuroprotective protein may be an *in vivo* inhibitor of BACE1, thereby regulating the production of amyloid beta. Having established the BACE1 assay, we are currently developing an inhibition assay to test this hypothesis that sAPPα inhibits BACE1 and we have a wide range of variants and fragments of the protein available that we can test in this inhibition assay. Ultimately a small fragment of the protein might form the basis for development of a therapeutic agent against sporadic Alzheimer's disease.

Dr James Ussher, Dr Ambarish Biswas & Dr Xochitl Morgan (Department of Microbiology & Immunology)

Investigating the spread of extended spectrum beta-lactamase (ESBL)-producing E. coli in Dunedin – AG 357

Sponsored by Southern Victorian Charitable Trust

Antimicrobial resistance, especially amongst members of

the *Enterobacteriaceae* family, is a rapidly evolving global emergency. In Dunedin, there has been an increase in the incidence of urinary tract infections caused by multi-drug resistant *Escherichia coli* that produce an extended-spectrum β-lactamase (ESBL). It is unknown how these ESBL-producing *E. coli* are spreading. In this study we have used whole genome sequencing to investigate the spread of ESBL genes. Sixty-seven of 84 isolates from 2015 were available for sequencing. Sequencing revealed considerable diversity of *E. coli* strains, suggesting that there is not a clonal outbreak in Dunedin. In contrast, there was some evidence of dissemination of mobile genetic elements, with 34 isolates (50.7%) containing one of four mobile genetic elements. Therefore there is evidence of both (1) multiple ongoing introductions of ESBL-encoding mobile genetic elements and the bacteria that carry them into Dunedin and (2) transmission of ESBL-encoding mobile genetic elements from person-to-person or from a point source. In ongoing work we are seeking to better define the mobile genetic elements that encode the ESBL genes.

(ii) OTAGO COMMUNITY TRUST GRANTS

The Otago Community Trust supports biomedical research in the Otago area with the proviso that the research is selected on topics that can relate well to issues understandable by the layperson. The three projects selected were:

Associate Professor Ruth Empson (Department of Physiology)

Visualising cerebellar driven motor learning – CT 359

The cerebellum is part of the brain that integrates sensory information (from sensors that tell us about our environment) with movement information (eg. where to place our foot). In fact electrical activity of the cerebellum is critical for refining and controlling movements during everyday life, yet we understand little about how the cerebellum achieves this. Here we aim to leverage our recent success using genetically encoded reporters of neuronal electrical activity to determine the nature and timing of cerebellar synaptic activity during movement. These previously impossible experiments could radically change the way we think about how we refine and control movement. Our aim is to visualise synaptic signals in cerebellar Purkinje neurons *in vitro* and *in vivo* and to understand how these synaptic signals change during cerebellar synapse plasticity and learned movements.

Objective 1 – to visualise glutamatergic synaptic responses and motor learning-based plasticity in cerebellar Purkinje neurons expressing Butterfly: We have made excellent progress on this objective though it has been challenging. We have been fortunate to engage the help of a long-term collaborator, Professor Thomas Knopfel, for the analysis of the signals, leveraging the use of Matlab and advanced mathematical tools to create custom analysis that is helping us interpret the data. The signals we record are unexpected (and interesting) and are raising important questions about how the cerebellar Purkinje Neurons integrate synaptic inputs.

Objective 2 – to visualise cerebellar Purkinje neuron synaptic responses *in vivo* during learned whisker movements in mice expressing Butterfly: It is proving very challenging to image the cerebellum *in vivo* but we are making progress. Visual access has been a major challenge but we benefitted greatly from a visit to Dunedin from Dr Ian Duguid from the University of Edinburgh in Dec 2016 who gave us some critical tips. We are also applying the custom made Matlab scripts from Objective 1 to help interpret the signals recorded *in vivo*.

Professor Ian Morison & Dr Robert Weeks (Department of Pathology)

Sorting out childhood leukaemia – CT 360

Our goal is to find a special population of blood cells that are only present before birth and are not present in adults. We suspect that this normal population of cells might be present in all normal children. We also suspect that these cells might be the cells of origin of leukaemia when development goes wrong. To find these cells we searched for a specific pattern of DNA modification (DNA methylation) in cord blood and in blood samples from young babies. To date, we have examined blood samples from four neonates, and 10 cord blood samples. Remarkably, we detected a signal from our "pre-birth" cell population (*TES* methylated alleles) in one of the premature babies (3% of the B cells of a four week-old, 28 week-gestation baby), and in three of 10 sequenced cord blood samples. Importantly, this signal (methylation of *TES*) has never been observed in normal adult blood. We have purified specific populations of stem cells and lymphocytes using fluorescence-activated cell sorting and have examined these by using cutting edge DNA sequencing techniques. Analysis of results within the next few weeks will determine which cell population contains this special population of fetal blood cells. Future work will continue to enrich for these cells thereby defining the cells-of-origin of childhood leukaemia.

Dr Andrea Vernall & Associate Professor Joel Tyndall (Department of Pharmacy) & Associate Professor Michelle Glass (Department of Pharmacology & Centre for Brain Research - Auckland)

Development of fluorescent ligands for cannabinoid type one receptor – CT 361

Cannabinoid type 1 receptor (CB_1R) is a receptor found in high levels in the human brain and nervous system. This receptor holds huge promise as a way to treat neuropathic and inflammatory pain, liver disease, obesity, spasticity, neurodegenerative and psychological disorders. This project aimed to develop the first fluorescent ligand for CB_1R, thus providing a tool to better understand the exact role this receptor plays in these disorders. The biological testing conducted on our newly developed fluorescent compounds revealed only moderate to weak binding to CB_1R. However, and unexpectedly, many of the compounds tested showed good binding to the other cannabinoid receptor subtype the cannabinoid type 2 receptor (CB_2R). CB_2R is found predominantly in peripheral tissues and holds huge therapeutic promise for treating conditions such as pain, inflammation, cancer, ischemia/reperfusion injury and rheumatoid arthritis. There is also a lack of imaging tools to study CB_2R, therefore compounds developed in this project are now being pursued for this purpose. The knowledge gained in this project is also being used to develop a different series of dedicated CB_1R fluorescent tools and these will be evaluated in due course.

(iii) RECENT ANNUAL GRANT ROUND

In **June 2017** there were 24 applications from the University of Otago and one from a research laboratory external to the Unversity totalling $635,280. Four of these applications were funded by the Foundation and their sub-sponsors: Mike Bird and Friends, JN Lemon Charitable Trust, OceanaGold, Southern Victorian Charitable Trust (~$107,000), and four by the Otago Community Trust (~$65,000). Abstracts of the proposed work can be found on the following web site http://www.omrf.org.nz

(B) LAURENSON AWARDS

Laurenson Awards are one-year grants for research concerned with the effects of diet and/or drugs on human health. In **December 2016** there were 16 applications (compared with 12 the previous year) from the University of Otago totalling $434,700 and four of these were funded at a total expenditure of around $92,000. All grants commenced between 1 April 2017 (except for LA 368 which started two months later) and final reports are due at the end of March (or May) 2018. Work in progress, as at the end of May 2017, is summarised below:

Dr John Ashton (Department of Pharmacology & Toxicology)

Drug combination testing in an *in vivo* model of anaplastic lymphoma kinase (ALK) mutated lung cancer - LA 366

Lung cancer kills more New Zealanders than any other type of cancer every year and an increasing proportion of new lung cancer cases (around 20%) are in people who don't smoke. In this type of lung cancer it is drugs that target particular proteins that drive the cancer that can cause remissions. Unfortunately these remissions are only temporary and the cancer develops resistance to the drugs. The aim of this research is ultimately to find ways to overcome this drug resistance in a particular type of cancer, ALK-positive lung cancer. We have now identified two very promising proteins to target alongside ALK to this end, which go by the acronyms IGF1R and MEK. In cell culture combining crizotinib (which targets ALK) with drugs that target these other proteins kills a much greater number of cancer cells than would be expected from each drug alone. We are now working on the specific aim of this grant, to develop a mouse model of lung cancer, where the target cancer cells engraft in the lung itself, by injecting the cells into the tail veins of the mice.

Associate Professor James Crowley (Department of Chemistry), Dr Heather Brooks (Department of Microbiology & Immunology) & Dr Gregory Giles (Department of Pharmacology & Toxicology)

Platinum (II) "click" antimicrobials: new weapons for fighting resistant microbes – LA 367

Resistance of microbes to currently used antimicrobial drugs represents a major threat to human health. We have synthesised a small family of platinum(II) "click" complexes and examined their antibacterial activity. The antibacterial activity of these complexes against the Gram negative bacteria *E. coli* and the Gram positive bacteria *S. aureus* has been examined using disk diffusion assays. Several of the complexes displayed high antibacterial activity against both *E. coli* and *S. aureus*. We are now examining if the compounds display broad spectrum activity against a wider selection of resistant bacteria. Additionally, we are examining the cytotoxicity of the complexes and potential modes of action. This research may lead to a new class of metallo-antimicrobials that could be used in the fight against resistant microbes.

Professor Sally McCormick (Department of Biochemistry) & Professor Samir Samman (Department of Human Nutrition)

Ribose-cysteine supplementation: translating from animals into humans – LA 368

Cardiovascular disease (CVD) is responsible for over 30% of deaths in New Zealand per year. Statin drugs reduce CVD death rates by reducing levels of low density lipoprotein cholesterol (LDL-C). However, statins alone do not adequately reduce CVD mortality, and cause side-effects in some individuals that preclude their use. Ribose-cysteine is a promising antioxidant compound that shows both antioxidant and LDL-C lowering properties in animals. We hypothesise that ribose-cysteine has the potential to protect individuals at risk of CVD. We propose to perform the first ribose-cysteine supplementation trial in humans to evaluate its effects.

Associate Professor Ivan Sammut, Dr Joanne Harrison & Dr Morgayn Read (Department of Pharmacology & Toxicology)

Developing a novel therapeutic to protect hypertrophic hearts in acute ischaemic surgery – LA 369

Low dose carbon monoxide (CO) has been shown to acutely protect cardiac function following acute ischaemic injury. Our group has been working actively with the Chemistry Departments at Otago (Prof D Larsen) and at Auckland (Prof M Brimble) to develop a novel set of organic CO releasing molecules (oCOms) for use as cardiac protective agents. Subsequent to filing our final PCT application on these compounds in Nov 2016, we published a full study on these compounds (Accepted in Chem Sci 28th May 2017, DOI: 10.1039/C7SC01647F). Work by our group also established that these compounds exemplified by oCOm-21 were cardioprotective in hearts subjected to acute ischaemic injury. We have gone on to discover the cell signalling mechanisms involved in this protection. The current Laurenson-funded research builds on this work to explore the capability of these compounds as protectants in patients with enlarged or damaged hearts undergoing bypass surgery. On commencement of this study, we initiated a breeding programme to develop the transgenic rat model of hypertension-induced cardiomyopathy compatible with the clinical presentation of the pathology. We will test our oCOms in these transgenic rats. This study requires a sustained level of hypertension to form following a chemically induced trigger. We are currently monitoring the hypertension development in these test subjects. Our preliminary data from this grant will be used to develop subsequent grant funding studies to be conducted in *in vivo* small and large animal models of acute ischaemia reperfusion injury such as occurs in cardioplegic cardiopulmonary bypass surgery.

(C) JACK THOMSON ARTHRITIS FUND

This OMRF fund was made possible by a bequest from the late Jack Thomson and commenced in 2011. In **December 2016** there were eight applications (compared with four in the previous year) from the University of Otago totalling $216,415 and four of these were funded at a total expenditure of ~$90,000. All grants commenced on 1 January or 1 March 2017 and final reports are due at the end of April or May 2018. Work in progress, as at the end of May 2017, is summarised below:

Associate Professor Haxby Abbott & Dr Ross Wilson (Department of Surgical Sciences)

The health impact of osteoarthritis: health-loss burden and cross-instrument mapping – JT 362

The project is progressing well. We have completed phase 1: to estimate the impact of knee osteoarthritis on the six dimensions and overall score of the SF-6D (SF-12) general health status questionnaire. Using publicly available information from the Osteoarthritis Initiative cohort study (n = 4796) and for the US National Health Measurement Study, we found that radiographic knee osteoarthritis (OA) was associated with substantial health losses on all dimensions of the SF-6D except for social functioning, increasing in the radiographic severity of OA for dimensions related to physical health. A manuscript reporting the results is currently in review with the high-impact journal *Rheumatology*. Phase 2 of the research: to produce an osteoarthritis-specific mapping between SF-12 summary scores and the SF-6D, is underway.

Dr Andrew Bahn (Department of Physiology)

Identification of oxypurinol transporters to decipher drug-drug interactions in gout treatment – JT 363

We have profiled expression of transporters in rat liver first as we are still working on the protocol to extract primary hepatocytes. Expression analysis shows that candidate genes such as OAT2, GLUT9, NPT1 and ABCG2 are expressed. We are currently optimising the western blot protocols to confirm expression on the protein level. The next step is now to optimise the primary hepatocyte extraction protocol. To make further progress and establish a human model, I decided to include HepG2 cells into the study. We have profiled these and have confirmed expression of candidate transporters such as OAT2 and GLUT9 on the RNA and protein level. We have also confirmed expression of xanthine oxidase (XO) to be able to do the suggested studies in this cell model before we do the final experiments in primary human hepatocytes. We tested GLUT9 knock down in HepG2 cells and that has worked perfectly and gives us the option to exclude the first transporter. Our first uric acid measurements of secreted uric acid on HepG2 cells exposed to oxypurinol or probenecid, which would mimic the situation in the patient, indicate that oxypurinol is not taken up by the cells. This would be a perfect explanation for the observation in patients that the increase of ser um oxypurinol due to the drug-drug interaction in the kidney does not get into the hepatocyte to inhibit XO. Furthermore, first uric acid efflux studies (out of hepatocytes on the sinusoidal side) revealed that the efflux is not inhibited by probenecid indicating that it is not a member of the OAT family that facilitates uric acid efflux out of the hepatocytes. We will continue to test further drugs in HepG2 cells to decipher the transporter and mechanism for allopurinol/ oxypurinol transport in human liver.

Dr Gareth Treharne, Ms Roisin Hegarty & Dr Tamlin Conner, (Department of Psychology) & Associate Professor Simon Stebbings (Department of Medicine)

Developing a patient-informed self-management programme for arthritis-related fatigue – JT 364

This project is being carried out in two phases. The first phase involves exploratory focus groups discussions about experiences of fatigue, and data collection is completed. We have conducted six focus groups, each including 3-4 people with arthritis. We have also conducted five one-on-one interviews. This allowed us to include some people who were unable to attend focus groups by interviewing them in their homes. Three of the interviews were follow-ups with rich informants from focus groups. The total sample of 22 people with arthritis in this exploratory phase meets our target. All focus groups and interviews have been transcribed and are currently being analysed to inform the second phase of the study, which will involve participants completing a daily diary about their fatigue. Focus group participants tried out the daily diary and had positive feedback that supported the need for daily recording of fatigue levels. We are currently finalising the protocol of the diary study before applying for ethics approval for the second phase. We will be presenting a poster on our findings from the focus groups at an international health psychology conference in the UK in July this year.

Associate Professor Sarah Young & Ms Estelle Peyroux (Department of Pathology)

Are bacteria the key to driving inflammation in ankylosing spondylitis? – JT 365

The spondyloarthritis diseases are thought to develop from a faulty immune response that drives an inflammatory response directed at joints. Ankylosing spondylitis (AS) is an arthritis affecting the spine that develops in young adults. Many AS patients have inflammatory bowel disease (IBD)-like symptoms and some go on develop IBD. Previous studies undertaken in our laboratory looked at the role of gut bacteria in AS disease. We made the unexpected observation that AS patients did not respond normally to particular gut bacteria. We believe this suggests immunity to these pathogens may be compromised. To determine how this altered response to bacteria is pertinent to AS inflammation, we are measuring the effect on immune cell populations implicated in tissue destruction. We have obtained ethical approval for obtaining blood samples from healthy donors and our AS patients. We have developed panels for measuring responses to bacteria-stimulated dentritic cells in the T lymphocyte cells of AS patients and healthy controls and have undertaken the first set of experiments with controls (measuring immune cell activation).

4. OTHER ACTIVITIES OF THE SCIENTIFIC COMMITTEE

OMRF Student Speaker Awards at the Otago Medical School Research Society:

The Student Speaker awards are given to the student speakers who, in the opinion of a panel of three to four judges, gives the best and second best oral presentation – based on both the components of the presentation and its scientific merit. To be eligible the candidates must report work that has been performed under the auspices of the University of Otago.

(1) At the **September 2016** scientific meeting of the Otago Medical School Research Society (OMSRS) there were 11 **doctoral** candidates (selected from 18 applicants based on their submitted abstracts). The first Prize ($1,000) funded by Otago Postgraduate Medical Society was awarded to **Kirsten Ward Hartstonge** (supervised by Dr Ros Kemp, Department of Microbiology & Immunology) on the topic of "Effector regulatory T cells are associated with disease-free survival in colorectal cancer". The second prize ($500), which was funded by the **OMRF**, was awarded to **Safina Gadeock** (supervised by Associate Professor Grant Butt, Department of Physiology, and Associate Professor Michael Schultz, Department of Medicine) on the topic of "Increased permeability is an inherent defect in the colonic epithelium of Crohn's disease patients".

(2) At the **May 2017** scientific meeting of the OMSRS there were 10 candidates (selected from 31 applicants based on their submitted abstracts). All were **summer research scholars** and 2 of the 10 (and 6 of the 31) had been sponsored by the OMRF. The **first prize** ($500) funded by the **OMRF** was awarded to **Julia Gouws** (supervised by Dr Karl Iremonger, Department of Physiology) on the topic of "Determining sexually dimorphic changes in corticotrophin-releasing hormone neural network activity induced by stress hormones". The **second prize** was awarded to two students ($250 each) funded by the **OMRF** and the OMSRS: **Bryony Harrison** (supervised by Dr Noelyn Hung, Department of Pathology) on the topic of "A new peripheral blood test for HPV to predict perinatal disease" and **Jodi Thomas** (primary supervisor Professor Neil Gemmell, Department of Anatomy) on the topic "Investigating early genetic regulators of sex change in labrid fish".

The OMRF summer research prizes since 2015 have been called *"The Pat Cragg Summer Scholar Speaker Prizes"* in recognition of the long-standing involvement by Associate Professor Pat Cragg in the summer research scholarship assessing committee.

OMRF-sponsored Invited Speaker for the Otago Medical School Research Society:

Professor Stephen McGarvey (Professor of Epidemiology & Anthropology, Director International Health Institute, Brown University) was the invited speaker on 5 September 2016 on the topic of "Interdisciplinary perspectives on Samoan biological responses to modernization: Evolutionary, genetic, nutritional and sociocultural factors".

OMRF-sponsored prizes at the Otago School's Science Fair:

The Foundation sponsors four prizes ($50 each) each year in the Special Prize category at the **Otago Aurora Science & Technology Fair** for secondary schools for projects involving medically orientated topics. The **August 2016** recipients were "Sleepy Science" by Isabel Parry (Year 7), "Can you drop your cake and eat it too?" by Marcus Davidson (Year 8), "How healthy are Dunedin rental houses?" by Grace Creighton & Campbell MacDade (Year 8) and "Screen test" by Anna Peyroux & Stella Caulton (Year 8). The Foundation's judges were Associate Professor Greg Jones, Dr Chris Brown and Dr Jo Kirman.

ACKNOWLEDGEMENTS

The Foundation continues to play an ever increasing role in funding Medical Research in Otago – may I thank the Scientific Committee for its dedicated efforts in the arduous, though satisfying, work of assessing the scholarship and merit of the many summer research projects and grant applications that it receives. We thank the Council of the Foundation for the support, advice and enthusiasm with which our funding recommendations are endorsed and the many Benefactors and Sponsors of the Foundation whose financial support has made all this possible.

Associate Professor Patricia A. Cragg
Chair, OMRF Scientific Committee
30 June 2017

FINANCIAL HIGHLIGHTS

Otago Medical Research Foundation Inc.

Financial Highlights

Otago Medical Research Foundation Inc.

This summary financial report has been authorised for issue by the Chairperson of the Council Mr Ken Dempster . The results presented in the summary financial report have been extracted from the full financial report for the year ended 31 March 2017. As such, this summary report cannot be expected to provide as complete an understanding as provided by the statements of financial performance, financial position and movements in equity of the Otago Medical Research Foundation Incorporated. A full copy of the audited financial report for the Otago Medical Research Foundation Incorporated for the year ended 31 March 2017 is available from the office of the Foundations administrators - Deloitte, Otago House, 481 Moray Place, Dunedin.

Statement of Financial Performance

For the Year ended 31 March 2017

	2017 $	2016 $
Operating Income		
Donations, Bequests, Subscriptions	610,183	642,828
Investment Income	261,572	276,231
Profit (Loss) on Disposal of Investments	18,193	(1,652)
	889,948	917,407
Less Expenses		
Administration	90,270	84,919
Promotion Costs	334,857	311,625
Total Expenses	425,127	396,544
Net Surplus before Research Grants	464,821	520,863
Research Grants - Current year	475,524	439,960
Net Surplus for the year	(10,703)	80,903

Statement of Financial Position

As at 31 March 2017

	Market Value	2017 $	2016 $
Current Assets		157,012	203,829
Investments	5,943,528	5,221,685	5,156,274
Total Assets		5,378,697	5,360,103
Current Liabilities		438,712	409,415
Total Liabilities		438,712	409,415
NET ASSETS (EQUITY)		4,939,985	4,950,688

Statement of Movements in Equity

For the Year ended 31 March 2017

	2017 $	2016 $
Revenue		
Net Surplus	(10,703)	80,903
Total Recognised Revenues and Expenses	(10,703)	80,903
Equity at the Beginning of the Year	4,950,688	4,869,785
Equity at the End of the Year	4,939,985	4,950,688

Statement of Cash Flows

For the Year ended 31 March 2017

	2017 $	2016 $
Net Cash Flows from Operating Activities	1,255	128,204
Net Cash Flows from Investing Activities	(47,219)	(58,534)
Net Increase / (Decrease) in Cash Held	(45,964)	69,670
Cash at the Beginning of the Year	108,391	38,721
Cash at the End of the Year	62,427	108,391

Statement of Service Performance

For the Year ended 31 March 2017

The Foundation aims to establish world-class medical research for the benefit of local, national and international health.

The Foundation has provided a calendar of events in which members, supporters and the public were invited to participate - the Club lunches, annual dinnner, annual golf day, and various other one-off events.

Grants & Scholarships approved during the year:	2017 Number	2017 Actual ($)	2017 Budget ($)	2016 Number	2016 Actual ($)
Annual Grants	5	141,964	138,000	7	171,050
Special Fund Grants	11	247,727	240,000	6	162,963
Summer Research Scholarships	23	94,000	92,000	28	114,000
Otago Medical Research Society Award Sponsorship	-	-	-	2	450
Total	39	$ 483,691	$ 470,000	43	$ 448,463

The full financial report of the Otago Medical Research Foundation for the year to 31 March 2017 were authorised for issue by the Chairperson of the Council. The full financial statements applied Public Benefit entity reporting (not for profit) standards. The auditor expressed an unqualified opinion. The summary financial report has been examined by the auditor for consistency with the full financial report. The auditor has expressed an unqualified opinion.

CROWE HORWATH NEW ZEALAND

AUDITOR'S REPORT

Crowe Horwath

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REPORT OF THE INDEPENDENT AUDITOR ON THE SUMMARY FINANCIAL STATEMENTS

To the Council of Otago Medical Research Foundation Incorporated

Opinion

The summary financial report, which comprise the summary statement of financial position as at 31 March 2017, the summary statement of financial performance, summary statement of movements in equity, summary statement of cash flows for the year then ended, and summary statement of service performance, and related notes, are derived from the audited financial statements of Otago Medical Research Foundation Incorporated for the year ended 31 March 2017.

In our opinion, the accompanying summary financial statements are consistent, in all material respects, with the audited financial statements, in accordance with FRS-43: Summary Financial Statements issued by the New Zealand Accounting Standards Board.

Summary Financial Statements

The summary financial statements do not contain all the disclosures required by Public Benefit Entity Simple Format Reporting – Accrual (Not-For-Profit). Reading the summary financial statements and the auditor's report thereon, therefore, is not a substitute for reading the audited financial statements and the auditor's report thereon. The summary financial statements and the audited financial statements do not reflect the effects of events that occurred subsequent to the date of our report on the audited financial statements.

The Audited Financial Statements and Our Report Thereon

We expressed an unmodified audit opinion on the audited financial statements in our report dated 4 July 2017.

Councils' Responsibility for the Summary Financial Statements

The Council is responsible on behalf of the entity for the preparation of the summary financial statements in accordance with FRS-43: Summary Financial Statements.

Auditor's Responsibility

Our responsibility is to express an opinion on whether the summary financial statements are consistent, in all material respects, with the audited financial statements based on our procedures, which were conducted in accordance with International Standard on Auditing (New Zealand) (ISA (NZ)) 810 (Revised), Engagements to Report on Summary Financial Statements.

Other than in our capacity as auditor we have no relationship with, or interests in, Otago Medical Research Foundation Incorporated.

Crowe Horwath.

Crowe Horwath New Zealand Audit Partnership

CHARTERED ACCOUNTANTS

4 July 2017

OTAGO MEDICAL RESEARCH FOUNDATION

Annual Report to 31st March 2017 & Notice of Annual General Meeting

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