

## Where does Tenovus Scotland fit into the puzzle of medical research?

John Dillon is a Professor of Hepatology and Gastroenterology at the University of Dundee, a principal investigator at their Medical School and has been an NHS consultant Hepatologist for over 22 years. His research has developed new ways to look after patients with hepatitis C and those with abnormal liver blood tests. He has also identified novel treatments for non-alcoholic fatty liver disease. He was a recipient of a Tenovus Scotland pilot grant 20 years ago.

"The path to major medical advances is paved by research. Rarely is that research accomplished by the stereotypical portrayal of a white coated scientist sitting in their laboratory, suddenly having a 'light bulb moment', rushing to the lab bench, swirling a brightly coloured test tube, pressing a button on a machine bedecked with flashing lights, shouting 'eureka' and then booking flights to collect the Nobel Prize. In reality, the pathway to those medical advances is paved by multiple broken 'tiles of ideas' made by many, and very different, people. Developments in medical research are achieved by reading the work and ideas of others in the field, reviewing how they have tested those ideas and where, as is the most common outcome, they have failed to prove their idea, discerning what that means for the underlying true pathway or mechanism.

So where does Tenovus Scotland fit into the puzzle of medical research? The testing of ideas and concepts is clearly vital to medical advances. Once an idea is fully developed and has good supporting evidence



Professor John Dillon

suggesting it is going to work, it is possible to design the big experiment that will prove the idea. This is usually expensive, and the big funders of research want to fund projects that are very likely to work and have an impact which will enhance their reputation. However, perfect ideas with supporting evidence do not appear by magic and must be developed, then tested. This process is less expensive but even more vital and is often associated with tears and broken ideas, which need to be re-used and developed further. In my own area of research into the cause of Non-alcoholic Fatty Liver disease, (NAFLD) which affects 30% of our population, causing cirrhosis of the liver and liver cancer, those early ideas with small grant support have been very important in development. 20 years ago,

Professor John Hayes and I started to think about NAFLD and Tenovus Scotland gave us a small grant to test our idea. We were wrong, but that broken idea led to better ones. Tenovus Scotland again supported some more experiments, which also didn't give us the expected results but did show we might be on the right track. 20 years on from those first conversations about the problem, we can now cure NAFLD in our animal models and cell cultures. We now have a drug that is safe to use in man, and we are currently looking for funding to test its efficacy in curing NAFLD. Tenovus Scotland has been vital in making those important broken titles that have paved the pathway of these advances."

Professor John Dillon

## Saltire Scotland's Outstanding Women of Scotland Award

Professor Jill Belch, who is the Vice-Chair of Tenovus Scotland Tayside, has been inducted



into the Outstanding Women of Scotland community, which also boasts amongst its members Nicola Sturgeon and Annie Lennox. Set up in 2015, Saltire Scotland's Outstanding Women of Scotland recognises and celebrates Scottish women from all walks of life and the inspiration their achievements set for the next generation.

Professor Belch was among ten new inductees who were unveiled at the 2019 Saltire Scotland ceremony that headlined the Woman of the World (WOW) celebration held in Perth. She is Professor of Vascular Medicine at Ninewells Hospital and Medical School Dundee. She has an international reputation in relation to her research into vascular disease and provides outstanding leadership in medicine. Jill has had a long association with Tenovus Scotland; her early research studies were supported by vital Tenovus Scotland pump priming awards, and she is an enthusiastic supporter of the Charity as a hugely important source of funds for clinical research in Scotland.

Jill said: "This award is a tremendous honour. I want to accept it on behalf of all the other outstanding women I have worked with and who have helped me get to where I am today. I am very lucky to have received their help and support and thank them and the Saltire Society for this amazing award."

## A New Venture

Our researchers carry out a wide range of research but have never been offered the opportunity by us to present their findings, build on networks and hear from established research leaders about their own experience in developing research careers. This was changed when we held two Symposiums in August and October last year.

Tenovus Scotland Grampian held its first networking event for many of the researchers it has supported over the years at the Robert Gordon University in Aberdeen, on 22nd August. The symposium, organised by Grampian Committee members, Professors Wainwright and Connolly, included longer, plenary lectures from established researchers who had benefitted from Tenovus Scotland grants in their earlier careers, and presentations from a variety of very talented, recent and current scholars, permitting them to learn of each other's work, and consider collaborative projects for the future. Together, they represented about £500,000 of funding which Tenovus Scotland Grampian has invested in a wide range of research projects at the University of Aberdeen, Robert Gordon University, and the University of the Highlands and Islands, in a diverse range of topics, including, amongst others, bowel cancer, pre-eclampsia, diabetes, Parkinson's disease, obesity, hypertension, and liver disease. In the evening, after a drinks and canapés reception, the public were invited to attend a lecture by Professor Dana Dawson, entitled "Broken Heart Syndrome – The New Kid on the Block in Cardiology", in which she described, in a most accessible way, her internationally renowned, seminal researches into takotsubo cardiomyopathy, initially funded by Tenovus Scotland.

Professor James Grieve, Chair of the Grampian Committee, in closing the meeting, thanked all the participants for their beautifully delivered and elegantly illustrated talks, and commended the occasion as a magnificent opportunity for communication, without which scientific endeavour loses much of its value.

Perth, on 4 October 2019, was the location for the first Tenovus Scotland National Researchers' Networking Symposium, allowing some 60 Tenovus Scotland funded researchers and their colleagues to meet each other and, also, to meet some of the Charity's Trustees and Committee Members. The central location allowed participation by researchers from almost all Scottish universities undertaking biomedical research. In a very full day, there were 15 short oral presentations of research activity and 13 poster presentations, the content reflecting the breadth of funding that Tenovus Scotland provides. The quality of the presentations was uniformly excellent, presenters having met the challenge of explaining their research in a way that made it accessible to all in the audience.

The inspiring Keynote Lecture was given by Professor John Dillon from the University of Dundee, drawing wider lessons from his own research activities into a variety of liver diseases. The meeting had a real 'buzz' with excellent audience participation in the scientific sessions and much social and scientific interaction in the refreshment and lunch breaks. All presenters received a certificate to record their contribution to the day, and prizes for the best oral and poster presentations were awarded to Claire Crossan (Glasgow Caledonian University) and Damilola Oresegun (University of St Andrews) respectively.

Post-event feedback was very positive, so future events along very similar lines, to encourage researcher interaction and networking, seem highly likely.

# Face to Face



with Dr Claire Crossan who is a researcher and lecturer in the field of virology at Glasgow Caledonian University

## What is your background and career history?

My career history is slightly unconventional for a research scientist in that I gained my PhD through publication, following several years as a research assistant after obtaining my BSc (Hons) in virology. I have researched various viruses over the last decade including hepatitis E, endogenous retrovirus, cytomegalovirus and porcine parvovirus. I have also spent time researching viral zoonosis and have worked on several projects examining the risk of pig viruses crossing over to humans if pig organs were used to alleviate the organ donor shortage!

## You received a Tenovus Scotland research pilot grant in 2017. What progress have you made to date?

The study is to investigate hepatitis E infection in patients with hepatitis C, to investigate injecting drug use as a route of hepatitis E transmission and to develop a culture system to allow us to grow and study hepatitis E in the laboratory. The grant allowed me to acquire a bank of 300 hepatitis C patient samples and screen these for hepatitis E, letting us assess the impact of this dual infection in this patient group. Additionally, the grant allowed me to establish an in vitro system to study hepatitis E more closely. This is very useful as hepatitis E is a difficult virus to study and little is currently known about its molecular biology. The data from this project has been presented at the European Society of Virology, the Scottish Diagnostic Virology Group, the Hepatitis C biobank meeting and the Tenovus Scotland symposium. The study has also led to a collaboration with the West of Scotland Specialist Virology Centre which has access to blood samples from people who inject drugs.

We are currently screening these samples and we hope to publish together the findings from this study early this year.

## What are the next steps and anticipated long-term health benefits?

In collaboration with the West of Scotland Specialist Virology Centre, we are currently submitting a funding application to the Chief Scientist Office to further investigate the findings from our Tenovus Scotland study and have included our findings from this study as preliminary data. In the long term we hope to identify patients most vulnerable to debilitating hepatitis E infection allowing the most vulnerable patients to be protected through improved awareness. As hepatitis E is mainly transmitted through the consumption of contaminated food, improved awareness among vulnerable groups will allow individuals to put into practice methods to reduce their risk of infection, such as improving food hygiene and adequately cooking food that may be contaminated with the virus. Also, we would like to further elucidate the pathogenesis of hepatitis E infections using our in vitro system. This will allow therapeutic targets to be identified for the development of anti-virals. This is important as currently there are only two drugs that can be used to treat hepatitis E and, as both induce unpleasant side effects, they are only administered in the most severe cases.

## You attended our National Symposium last November. Was it beneficial?

Yes! I really enjoyed attending the symposium. It was great to hear talks and read posters of the many and varied projects Tenovus Scotland has supported. It was also very enjoyable to present my own work there and discuss it with others who seemed genuinely interested. The overall

atmosphere was very friendly and welcoming. I think it is telling that I spoke to more delegates at the Tenovus Scotland symposium than I have at all the other meetings I have attended over the years put together! Also, many of the other attendees are at a similar stage in their careers and so it was really useful to share experiences with each other, even if our disciplines varied.

## Why is it important for Tenovus Scotland to continue awarding pilot grants?

I think most scientists would agree that there is nothing more frustrating than to have a very exciting idea but not to be able to explore it due to lack of funding. I think most would also agree that acquiring funding is becoming increasingly challenging, with fewer opportunities and greater competition. Many funding bodies are requesting more from their applicants in terms of experience, preliminary data and collaboration and, as an early career scientist, or any scientist with a completely novel idea, it is difficult to impossible to meet all these requirements. Indeed, I have had several conversations with colleagues who, despite being passionate and having lots of great plans for research for improving lives, have considered changing career due to this difficulty. Tenovus Scotland grants are a great opportunity for scientists with new ideas to explore and hone them before taking them forward to the next stage. They allow early career scientists a bit of funding breathing space to get their foot on the research-funding ladder and, as I witnessed at the symposium, Tenovus Scotland supports many studies with great potential for improving lives.

## What fact about you might surprise people? or What do you do apart from your research?

I have a full motorcycle licence and ride a Triumph Bonneville T100.

## Blood test raises hopes of tackling 'silent killer'

The research was funded by the Scottish Government Chief Scientist Office and Tenovus Scotland Tayside and was published by the Journal of the American Heart Association.

It is the 'silent killer' that claimed the life of Albert Einstein and affects 1% of men over the age of 65, but researchers at the University of Dundee believe they may be able to reduce the number of fatalities caused by abdominal aortic aneurysms.

Aneurysms are the swelling and weakening of the arterial wall. Aortic aneurysms occur in the aorta, which delivers blood from the heart to organs. Aneurysms are often called a silent killer, because patients can display no symptoms until the aneurysm bursts. Around 80% of all patients with a ruptured aneurysm die from the condition.

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# PhD Scholarship Programmes

Building on our successful funding of Pilot Grants, we have developed over the last seven years an additional fresh initiative to continue to promote and support cutting-edge medical and scientific research - our Scholarship Programmes.



Hayley Melville

As part of the path to becoming independent investigators, many young scientists and research-minded clinicians normally require higher qualifications, the route to which requires secure funding in the form of a research scholarship to allow the pursuit of full-time investigation with provision of stipend and support costs for laboratory and other expenses. Our Scholarships allow candidates of the highest calibre to engage in meeting their goals. Sixteen Scholarships have already been awarded, with five students successfully completing their studies so far.

One of the Scholarships within the overall Programme is the highly prestigious Princess Royal Tenovus Scotland Medical Research Scholarship, which has been established with the backing of our Patron, HRH The Princess Royal. Our latest Princess Royal Scholar, Hayley Melville, started her studies at the Heriot-Watt University in Edinburgh

in September. Her thoughts, as she sets out on the next step of her research journey, are as follows.

“During childbirth the placenta can become constricted due to contractions, resulting in a limited oxygen supply to the baby. This condition is called hypoxia. Currently, fetal monitoring during childbirth has many drawbacks. It increases the risk of infection and is both invasive and intermittent. At the moment, there is no safer and continuous monitoring system available.

With my background in polymer chemistry, I propose to design a minimally invasive device aiming to solve this issue. This device would allow clinicians to monitor fetal lactate levels throughout labour in real-time. Monitoring lactate would allow for a timely diagnosis of potential hypoxic events.

This is a true engineering challenge which would address a major unmet clinical need. The Tenovus Scotland scholarship will allow me to use my knowledge and collaborate with experts to attempt to solve this challenge. It is a real honour to have the opportunity to work alongside a passionate interdisciplinary team of clinicians and engineers. This collaboration allows us to share and create medical knowledge on a level that wouldn't have been achievable without the support of Tenovus Scotland.”

CONTINUED FROM PAGE 3 **BLOOD TEST RAISES HOPES OF TACKLING 'SILENT KILLER'**

A team, led by Dr Anna Maria Choy, Senior Clinical Lecturer and Honorary Consultant Cardiologist at the University, has devised a test that detects the presence of desmosine, an amino acid that diseased aortas release into the blood and urine. They believe this can improve the diagnosis and monitoring of aortic aneurysms while possibly aiding efforts to develop new therapies to slow down their progression.

Men aged 65 and over are most at risk and may be invited for ultrasound screening. If an aortic aneurysm is detected, they will be asked to attend regular follow-up checks but, as aneurysms do not expand at a linear rate, this means rapid growth between screenings may be missed.

Furthermore, the size of an aneurysm does not always correlate to how close it is to rupturing. However, the Dundee researchers believe that measuring the level of desmosine is a more effective way of identifying which patients are in most urgent need of treatment.

Dr Jeffrey Huang, a principal investigator who developed the desmosine assay, said, “The bottom line is that in any disease of the aorta we think this amino acid may have a role to play in detection, prediction and follow up.”

## PILOT STUDIES EXPLAINED

Medical research is generally quite costly, requiring funding for staff, materials and equipment. Major funding bodies will not commit funds without some basic groundwork to suggest that further study is justified. Pilot studies undertake this groundwork, establishing the feasibility of a proposed research programme and informing its design and execution.

Examples of issues tested in pilot studies -

### Can the planned research procedures be undertaken?

Are the available facilities suitable for the research, do the planned experiments work in practice, is there preliminary evidence of interesting findings?

### What is the size of the changes or effects seen?

Smaller changes need more experiments to show the effect, in turn affecting the cost of the planned research programme (and thus funding sought); pilot study data can reduce the uncertainty about what larger studies may show.

### What possible problems might arise?

Problems often only appear once research work starts; best to have identified (and solved) these issues before starting major research work.

### What other skills may be needed?

Preliminary work may show the possibility, or even need, to involve additional collaborators (scientists, data analysts, statisticians etc.); best to do so before commencing major work.

Success in a pilot study is not assessed in the same way as in a larger project. The aim is not to make new discoveries or progress scientific knowledge, but to show that such discoveries or progress are feasible and that the researchers have the skills and facilities to use larger research funds to best effect. Only with this assurance in place will major funding bodies be willing to commit their limited resources in the current, highly competitive, research environment. Tenovus Scotland funding for pilot studies is thus often crucial to unlocking further funds, helping new projects take their first steps toward their goals.