High pressure talk with Professor Rhian Touyz

At the Institute of Cardiovascular and Medical Science (ICAMS) at the University of Glasgow, world-renowned researchers are dedicated to discovering mechanisms of cardiovascular disease (CVD) in their quest to advance new treatments and to develop improved prevention, management and diagnostic strategies. Professor Rhian Touyz takes an innovative new approach to preventing CVD by conducting extensive research into other intricately linked critical conditions. She spoke with us at Research Outreach to discuss the institute's aim, outlining the vital research and vision for the future.

Professor Rhian Touyz is the Director of the Institute of Cardiovascular and Medical Sciences (ICAMS) at the University of Glasgow, the British Heart Foundation (BHF) Chair of Cardiovascular Medicine and Director of the ICAMS BHF Award of Research Excellence. She specialises in hypertension, abnormally high blood pressure which increases the risk of heart attacks, strokes, kidney failure and cognitive decline (dementia). Her mission is to help enhance human health through her research into the causes of cardiovascular disease.

Research Outreach caught up with Prof Touyz to talk about the latest ICAMS research and her role as leader in the 400-member institute. Here she discusses the development of her fascination with hypertension as one of the key causes of CVD and provides an insight into the organisation's excellent contribution to cardiovascular research. She also discusses her earlier career and shares her hopes for the future.

Hi Rhian! Can you tell us more about the relationship between the Institute of Cardiovascular and Medical Sciences (ICAMS) and the British Heart Foundation Glasgow Cardiovascular Research Centre?

The Institute of Cardiovascular Medical Sciences is a research-intensive institute that focuses on cardiovascular research, both basic and clinical, in the College of Medical, Veterinary and Life Sciences within the university. In 2014, ICAMS was recognised by the BHF as a Centre of Research Excellence, where it was successfully awarded a highly competitive grant. Through the award, ICAMS established the BHF Centre of Research Excellence in Vascular Bioscience and Medicine. The BHF Research Excellence Award represents an outstanding achievement, recognising the calibre of expertise in pioneering cardiovascular research here at ICAMS. It's very competitive and in the last round of applications, there were thirteen applications from the UK, of which six institutions were awarded, including: Oxford, Cambridge, Kings, Imperial, Edinburgh, and Glasgow. We are very proud to be part of these big-name institutions, especially given the high level of competition

Our institute focuses on cardiovascular research, specifically cardiovascular diseases. The diseases we focus on relate to heart disease, especially heart failure and ischemic heart disease or heart attacks. We conduct research in pulmonary hypertension, hypertension or high blood pressure, along with diabetes and metabolic disease as it is implied in cardiovascular disease. In addition to this, we have a very strong programme in stroke research and kidney failure because these pathologies are also intricately linked to cardiovascular disease. Those are our main areas of research in terms of disease processes, and alongside this, we also research the basic science that feeds into the mechanisms of these diseases, such as: molecular biology, cell biology, redox biology, experimental models, physiology, genetics, proteomics, imaging, and electrophysiology. Taking our research and discoveries from the laboratory to the patients and population is a major goal, and as such, we have a very strong programme on 'healthy lifestyle' and cardiovascular protection, enabling us to interact very closely with doctors in the hospitals.

Could you provide us with more detail as to what hypertension is?

Some people often get confused and they think hypertension means anxiety or high stress levels but essentially, hypertension means high blood pressure or high pressure in the blood vessels.

Every time the heart beats, it contracts and then relaxes, allowing the pressure to be pushed along the vessel so that the blood vessels can drive the blood flow, supplying all the tissues and organs with nutrients, especially oxygen. If that pressure gets too high, it can cause damage to the blood vessels and organs. I always say that the best way of thinking about this is if you consider a hose pipe with a tap at the end. If you turn the tap on and the water flows through the hose pipe, then this can be viewed as a healthy working flow. But if you constrict the hose pipe, or make the lumen or inside of the hose pipe narrower, the pressure naturally must increase to allow for water to flow through, and that's exactly what happens with hypertension. The heart is the tap in this analogy; it must pump harder to make the blood flow through the vessels when the pressure is higher, and this is what causes damage to the kidneys, heart, brain and other organs.

Are there any recent breakthroughs or interesting projects that you're particularly excited about?

Yes, there's a lot of exciting work going on. Our institute has greatly contributed and made a substantial impact to new treatments and clinical guidelines for heart failure, stroke, diabetes and hypertension. In fact, there was an enormous amount of publicity recently from one of our researchers who showed that cycling exercises are particularly important for maintaining cardiovascular health. I'm embarrassed to say I don't cycle myself but I think that this research will make me and many others start.

Imaging arteries with fluorescent probes using high powered specialised microscopes allows researchers to detect proteins and cells that regulate vascular function

I believe we're going to see big advances in using new technologies and methods to understand the fundamental processes of cardiovascular disease

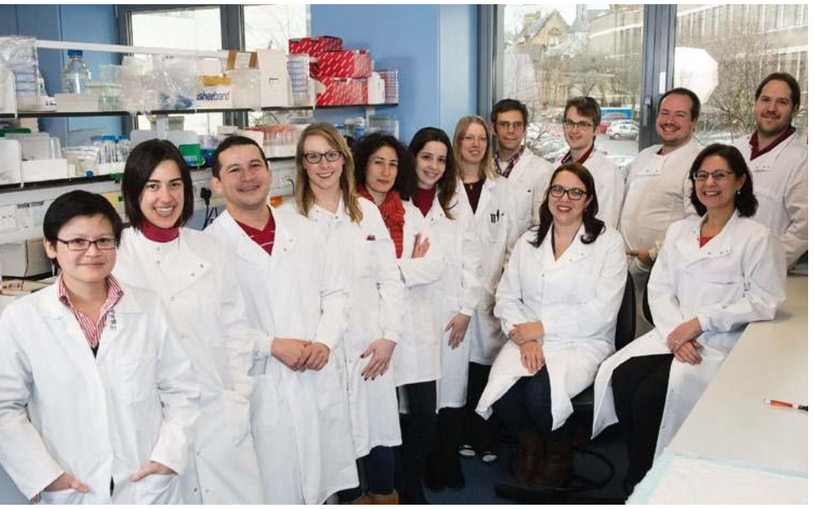
We have conducted a vast amount of research on statins and how they influence cardiovascular and cardiometabolic disease, especially in relation to the treatment of diabetes. These new breakthroughs will be published later this year.

My personal interest, at the basic science level is to examine how small blood vessels undergo damage and inflammation, and also how that may play a role in the injuries that underlie most cardiovascular diseases.

What impact has the BHF GCRC had on cardiovascular medicine since it was established?

The BHF GCRC has played a very important role in several large clinical trials related to hypertension, heart failure and to statins or treatment of high cholesterol. We were very instrumental in some of the earliest studies in the field several years ago, and these have really impacted clinical cardiovascular medicine. Ultimately, those trials were influential in the change to guidelines for clinical practice.

Also, the research work conducted in Glasgow has historically played a major role in the management of stroke, and in setting up a stroke unit that has effectively improved the outcomes for stroke patients. In fact, Glasgow has generally played a very important role in neurological disorders. For example, the universal Glasgow Coma Scale, devised right here by our neurologists, is the most common scoring system used to describe the level of consciousness in a person following a traumatic brain injury.



The wonderful Touyz lab – comprised of dedicated young researchers, students, post doctoral fellows and technicians. This is a truly international lab with staff from Brazil, Poland, Greece, France, UK, Canada, South Africa and Sweden

Can your research significantly change the outcome of a stroke?

Well, we do know for example, that one of the biggest ways to prevent stroke is by maintaining normal blood pressure. Hypertension is a major cause of stroke, and so if we can control hypertension, then we can prevent stroke by about 20–40%, and that's been well proven.

Our scientists and clinical researchers have discovered a treatment called thrombolysis, otherwise known as thrombolytic therapy, which is a treatment to dissolve dangerous clots in blood vessels, improve blood flow, and prevent damage to tissues and organs. They discovered that the sooner you complete thrombolytic treatment, the greater the chance of survival for stroke patients.

One of our stroke specialist doctors has also played a very important role in the establishment of a stroke unit, in terms of when the patient comes in, what should be done and how the stroke unit should be organised effectively – this makes a greater difference to the outcomes for stroke patients.

As well as being the director, you are a clinician scientist carrying out research into hypertension, with an active role in patient care. How do you find the time to balance each of these positions?

To be honest, it is demanding and challenging. Although, I am very fortunate because I have a great network of wonderful supportive staff along with an outstanding PA who helps run everything. Hence it boils down to great team work. I am truly blessed because I thoroughly enjoy every aspect of my work – from the leadership to the discovery science as well as mentoring students to treating patients.

In terms of balancing my leadership, clinical, and research role, it all comes down to effective time management and prioritising the work that really needs to get done. These skills allow me to carry out these roles successfully.

That sounds like a good recipe. What initially triggered your interest in hypertension research?

My interest in hypertension research goes back many years ago to when I was a medical student on a hospital ward and I witnessed a very young man have a terrible stroke. He essentially became a quadriplegic, (a person affected by paralysis of all four limbs). I asked the consultant at the time, why did this young man have a stroke and change from being healthy to totally incapacitated? The consultant said, "This patient had severely high blood pressure and had that blood pressure been controlled, the stroke could have most likely been prevented". At that time, I asked, "What are the causes of high blood pressure?" with the reply that, "We don't know exactly what the causes of high blood pressure are". Therefore, my interest all stems from this first-hand experience. I became intrigued to try to discover the causes of hypertension, and since then, I have specialised in that field.

I'm very interested in trying to understand what causes high blood pressure, as we already know that if you prevent hypertension or properly control blood pressure, other conditions directly linked to cardiovascular disease can be prevented. By preventing patients from getting strokes, heart failure, heart attacks, atrial fibrillation, dementia, or becoming dependent upon on dialysis, where they can't work anymore and where they spend a lot of time in hospital, we would have a much healthier population; from a public and economic health point of view, this is much more attractive. That's why I'm so committed to this research and study to try to prevent it or at least better manage it.

So you're now based in Scotland, but were originally from South Africa, and have worked across North America – do you find that attitudes to cardiovascular disease differ in each region?

Cardiovascular disease is a really important cause of both morbidity and death across the whole world. We used to believe that it was only in the more developed western world that this was a problem. However, today we now know that globally, cardiovascular disease is the major cause of morbidity and death. We believe this is down to the fact that cardiovascular disease, especially hypertension, causes strokes, heart failure, kidney disease, and even vascular dementia.

In terms of the attitudes of the professionals, I think today everybody appreciates that cardiovascular disease is a medical priority that needs attention. In each region I've worked in, I found that the focus on prevention is very important, especially in terms of lifestyle modifications. Although, in Canada, South Africa and here in Scotland, some of the treatment protocols are a little bit different.

Of course, while all patients are appreciative of good medical care, there are a few notable difference in patient attitudes across the different regions.

In North America for example, patients tend to assume more responsibility for their own health and medical situations. Whereas here in Scotland, patients give most of the decision-making responsibility to the doctors. Of course, this is just from my personal observations and experiences. At the end of the day, it's really important that patients get the best medical care that is appropriate for their particular disease.

How do you think cardiovascular research will develop during the next decade?

I think we're at the start of a very exciting time for cardiovascular research; in fact, for all biomedical research. I believe we're going to see big advances in using new technologies and methods to understand the fundamental processes of cardiovascular disease. For example, we talk about precision medicine today, understanding the exact genetic make-ups in each individual patient, in terms of protein, metabolism and fats that can contribute to the formation of diseases.

Modern medicine of the near future will focus on treatment of the specific disease characteristics of each individual patient using a personalised or precision medicine approach

Prof Touyz – a clinician scientist – working at the bench and the bedside

Thought Leader

I think this is all going to become much clearer in the years ahead, and hopefully modern medicine of the near future will focus on treatment of the specific disease characteristics of each individual patient using a personalised or precision medicine approach.

I also believe that we might see the emergence of different methods in the way we treat patients. Maybe we'll use different strategies, rather than using drugs as we know them today. We may use things like nanotechnology, enabling more sophisticated diagnostic opportunities and yielding improved treatment. Essentially, new technologies and new approaches will advance over the next few years, along with the development of a greater understanding about the very fundamentals of disease processes. Finally, we may even see more management and treatment done within the home, where patients and doctors will be 'hooked up' through mobile apps and other technologies.

• For more information about the Institute of Cardiovascular and Medical Sciences at the University of Glasgow, please visit their website at www.gla.ac.uk/researchinstitutes/icams/

Professor Rhian M Touyz
British Heart Foundation (BHF)
Chair in Cardiovascular Medicine
Director - Institute of Cardiovascular & Medical Sciences
BHF Glasgow Cardiovascular Research Centre
University of Glasgow
126 University Place
Glasgow G12 8TA, UK

E: Rhian.Touyz@glasgow.ac.uk
T: + 44 (0)141 330 7775/7774
W: www.gla.ac.uk/researchinstitutes/icams

University of Glasgow
Institute of Cardiovascular & Medical Sciences