# Scientists identify area that could sever communication between brain and heart in disease

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A team of neuroscientists and anaesthetists, who have been using pioneering techniques to study how the brain regulates the heart, has identified a crucial part of the nervous system whose malfunction may account for an increased risk of death from heart failure.

The findings, published online (ahead of print) in the [Journal of Physiology](http://jp.physoc.org/), could lead to more targeted therapies to help reduce serious illness and death in cardiovascular disease.

The research team, led by Dr Tony Pickering and Professor Julian Paton from the University of Bristol and colleague Professor Robin McAllen from the [Florey Neuroscience Institute in Melbourne](http://www.florey.edu.au/), developed novel methods which enabled them to explore the activity of nerve cells as they control the beating heart.

The brain controls the heart through two divisions of the nervous system; parasympathetic (vagal) and sympathetic nerves.

One of these nerves, the vagus, acts to slow heart rate as part of protective cardiovascular reflexes, which are vital for cardiac health.

A loss of vagal control is a major risk factor in human cardiovascular diseases such as heart failure and hypertension.

Vagal information to the heart is transmitted through a special group of nerve cells that remarkably lie on and within the beating heart muscle.

Until now, these important neurones have proved especially difficult to access and record in a system with preserved natural connections.

However, academics at the [Bristol Heart Institute](http://www.bristol.ac.uk/bhi/) and [Bristol Neuroscience](http://www.bris.ac.uk/neuroscience/) have developed a novel technique that allows the neurones to be held stable while the heart is still beating and their central neural connectivity remains intact.

Using this method the researchers were able to produce high-precision recordings from the cardiac ganglion neurones on the surface of the beating heart whilst retaining their inputs from the nervous system.

The results reveal how these neurones process their inputs and demonstrate that the ganglion plays a key role in regulating the level of vagal tone reaching the heart.

This identifies the cardiac ganglion as a site at which the vagal transmission may fail and therefore a potential target for interventions to restore vagal control in cardiovascular diseases.

Dr Pickering, Wellcome Senior Clinical Research Fellow, Reader in Neuroscience and Consultant in Anaesthesia in the [University of Bristol’s School of Physiology and Pharmacology](http://www.bristol.ac.uk/phys-pharm/), said: “These findings are important because they clearly show the cardiac ganglion as a key player in determining the level of vagal tone reaching the heart.

“As loss of vagal tone is found in a number of cardiovascular diseases such as heart failure, following heart attack, in high blood pressure and diabetes, and is associated with poor prognosis and an increased risk of death, our results indicate that therapies targeted at the cardiac ganglion could restore vagal tone and potentially improve outcomes.”

Helene Wilson, Research Advisor at the [British Heart Foundation](http://www.bhf.org.uk/) (BHF), said: "The vagus nerves are absolutely vital for the control of the speed and regularity of our heart's beat.

We don't know a great deal about how the vagus nerves exert this control, and researchers have found it very hard to study it - partly because of the motion of the heart as it beats.

These researchers have now developed a technique to study the processes in an intact vagus nerve which is still attached to heart, and have already helped us understand the process better.

New insights into how the vagus nerves transmit their effects on the heart could lead to important new ways to treat patients with diseases such as heart failure, arrhythmias and hypertension."

The study is a result of an international collaboration between the University of Bristol and academics at the Florey Neuroscience Institute in Melbourne. The work is funded by the [British Heart Foundation](http://www.bhf.org.uk/), the [Wellcome Trust](http://www.wellcome.ac.uk/), and the [National Health and Medical Research Council](http://www.nhmrc.gov.au/) ([NHMRC](http://www.nhmrc.gov.au/)) in Australia.

## Further information:

Paper

The paper (published online ahead of print) entitled ‘Processing of central and reflex vagal drives by rat cardiac ganglion neurones: an intracellular analysis’ by Robin M. McAllen (2), Lauren M. Salo (1), Julian F. R. Paton (1) and Anthony E. Pickering (1), is published in the Journal of Physiology.

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Bristol Neuroscience

Neuroscience is one of the key areas of research at the University of Bristol. Furthermore, the city of Bristol has one of the largest concentrations of researchers engaged in neuroscience in the UK, many of whom are internationally recognised. In 2003 Bristol Neuroscience (BN) was established to enable all neuroscientists working in Bristol – both within the University and its partner hospitals across the city – to make full use of all available resources and expertise.

BN runs numerous activities to encourage the dissemination of ideas, to create opportunities for interdisciplinary research, and to facilitate the pursuit of neuroscience to the highest possible standard. For further information on BN please see www.bris.ac.uk/neuroscience or contact Dr Anne Cooke, b-n@bristol.ac.uk.

Bristol Heart Institute

The Bristol Heart Institute is made up of over 200 researchers and clinicians, from eight different departments in the University of Bristol, spanning three faculties, and from associated Bristol NHS Trusts. Research income is generated from grants, with the British Heart Foundation being the Institute’s main funder.

As well as improving collaboration between scientists and clinicians within the Institute, the aim is to communicate research findings to the public. For more information on research at the Bristol Heart Institute visit: http://www.bris.ac.uk/bhi