

Scientists identify mechanisms in kidney disease that trigger heart attacks and strokes

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(Medical Xpress) -- Up to 15 per cent of the population in the UK are affected by kidney disease. While a small number of individuals will develop kidney failure, a far greater number will develop circulatory diseases such as heart attacks and strokes. New research, led by academics at the University of Bristol, has now identified the underlying mechanisms that can contribute to an increased risk of cardiovascular disease.

The study, published in the *Journal of the American Society of Nephrology*, aimed to investigate the cellular changes that occur in [kidney disease](#), which also increase the risk of circulatory disease by about the same amount as smoking. Until now, the factors that link kidney and widespread circulatory diseases were not well understood given that it is difficult to study the inner lining of blood vessels in

patients.

However, using animal models with a form of chronic kidney disease that mimicked the kidney disease seen in patients, the researchers found that the inner lining of blood vessels throughout the body is damaged. The damage, which results in leaky blood vessels throughout the body, is typical of the changes seen in patients.

This inner lining of blood vessels comprises a thick layer of sugars and proteins that form a continuous coat inside blood vessels, and provides protection to blood vessel walls. When this inner coat becomes damaged then blood vessels become leaky and inflamed, and previous studies have shown that damage to this inner layer speeds up the process of atherosclerosis (“furring up” of arteries).

If the findings of damage to this blood vessel lining in kidney disease are also true in patients, then damage to this inner layer may go some way to explain the very high rates of circulatory disease in patients with chronic kidney disease. Interestingly, the team also found that substances that stick to the inner layer improve the function of the damaged blood vessels, by making the vessels less leaky.

Dr Andy Salmon, lead author and MRC Clinician Scientist Fellow and Consultant Senior Lecturer in Renal Medicine in the University’s School of Physiology and Pharmacology, said: “These findings are important as it may mean that protecting or even restoring the inner layer could provide protection to blood vessels. There is still much to explore, and while we have shown that damage to the inner layer in kidney disease disrupts the function of some blood vessels, we do not yet know how much it contributes to the final process of ‘furring up’ of arteries.

“We have previously shown that this inner lining can be restored by growth factors that exist in the body, but we do not yet have any drugs

that achieve the same effect, and so there is much work still to be done.”

Professor Jeremy Pearson, Associate Medical Director at the British Heart Foundation (BHF), which co-funded the study, added: “We’ve known for some time that there’s a link between kidney disease and heart and [circulatory disease](#) but it’s been unclear why. This study may help unravel this mystery.

“This study shows that damage to the glycocalyx – the sugar coating that lines our blood vessels – causes [blood vessels](#) in patients with chronic kidney disease to become more leaky. The discovery could help lead towards new ways of preventing kidney disease in the future.

“But this breakthrough also brings us closer to understanding how other circulatory diseases develop, including coronary heart disease, the cause of heart attacks. We need to put this vessel sugar coat under the microscope, because it could be important in many different ways.”

The study, entitled *Loss of the endothelial glycocalyx links albuminuria and vascular dysfunction*, is published in the *Journal of the American Society of Nephrology*, was supported by the British Heart Foundation, the Medical Research Council, the Academy of Medical Sciences and the National Institute of Diabetes and Digestive and Kidney Diseases.

More information: Loss of the endothelial glycocalyx links albuminuria and vascular dysfunction, 2012. [doi: 10.1681/ASN.2012010017](#)

Provided by University of Bristol

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