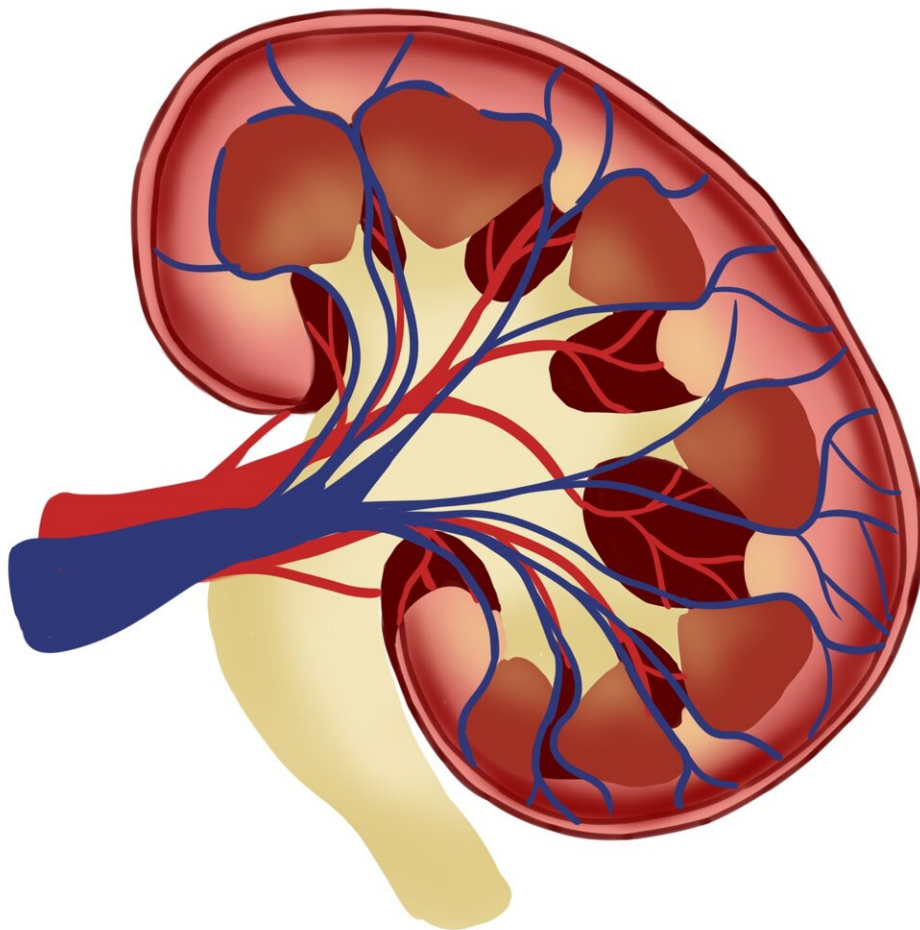


Inorganic nitrate can help protect patients against kidney damage caused during coronary angiographic procedures

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A five-day course of once-daily inorganic nitrate reduces the risk of a serious complication following a coronary angiogram, in which the dye used causes damage to the kidneys. The clinical trial, led by Queen Mary University of London, also showed that the five-day course improves renal outcomes at three months and major adverse cardiac events (MACE) at one year compared to placebo.

Contrast-induced nephropathy (CIN), also known as contrast associated [acute kidney injury](#) (CA-AKI), is an uncommon but serious complication following coronary angiography. Coronary angiography is a commonly used procedure that allows health care professionals to examine the blood supply to the heart. A special dye, which is visible on X-rays, is injected into the body and when the dye reaches the coronary arteries, an X-ray is taken.

While [coronary angiography](#) is safe for most people, some patients are at high-risk of CIN, which is a significant cause of death and critical illness for high-risk patients who have had coronary angiographic procedures. For [older people](#) and those with heart failure, [chronic kidney disease](#) (CKD) or diabetes with CKD, incidence of CIN can be as high as 55%. CIN can lead to serious consequences for patients, including longer hospital stays, increased need for kidney transplants, recurrent revascularization procedures, and higher mortality.

One of the principal mechanisms underlying CIN is thought to be an increase of oxidative stress and the accompanying decrease in levels of protective nitric oxide (NO) in the body. This randomized controlled trial, led by Professor Amrita Ahluwalia at Queen Mary University of London, examined whether ingesting [inorganic nitrate](#) (NO_3^-) which becomes nitrite (NO_2^-) and then NO in the body—could compensate for the loss of NO in the body and help prevent kidney injury in [high-risk patients](#) receiving contrast angiography.

A group of 640 patients undergoing angiography for non-ST-elevation Acute Coronary Syndrome (ACS) (NSTEMI-ACS) at Barts Health NHS Trust took part in the trial, with 319 receiving once daily inorganic nitrate capsules ([potassium nitrate](#)) and 321 receiving a placebo capsule (potassium chloride). The study showed that patients receiving inorganic nitrate treatment had significantly reduced CIN rates (9.1%) vs. placebo (30.5%), lower rates of procedural myocardial infarction (2.7% vs. 12.5%), improved three-month renal function and reduced one-year major adverse cardiac events (MACE) (9.1% vs. 18.1%) compared to patients who had received the placebo treatment.

These findings together support the concept of NO replacement in the form of a short five-day simple inorganic nitrate capsule as a potential solution to prevent CIN and improve both cardiovascular and kidney outcomes after ACS.

Professor Ahluwalia, Dean for Research, Faculty of Medicine and Dentistry at Queen Mary, said, "The current gold-standard treatment for blocked coronary arteries is inserting a stent. To do this the cardiologist needs to be able to see where the artery is blocked, and that is why it is necessary to use a dye to allow the artery to be clearly seen on the angiogram. This trial suggests that a simple 5-day regime of low-cost inorganic nitrate capsule eliminates the risk of what were, up till now, unavoidable damaging effects. We hope to confirm these findings in a large multi-center trial in the near future, but the results of nitrate-CIN give us hope."

Kate Bratt-Farrar, Chief Executive at Heart Research UK, said, "...this research led by Professor Ahluwalia, which hopes to make changes to coronary angiogram protocols and reduce the risk of serious complications for patients... will allow [health care professionals](#) to conduct safer treatments and improve patient well-being for those at high-risk of developing complications.

"This study has the potential to save countless lives across the UK."

Approximately 250,000 coronary angiograms are carried out in the UK every year. Contrast-induced nephropathy (CIN) is deemed responsible for a third of all hospital-acquired acute kidney injuries. Recent assessments of the occurrence of this complication globally suggest an incidence of 12.8% with an associated mortality in those experiencing CIN of 20.2%.

The work is [published](#) in the journal *European Heart Journal*.

More information: Amrita Ahluwalia et al, Inorganic nitrate benefits contrast-induced nephropathy after coronary angiography for acute coronary syndromes: the NITRATE-CIN trial, *European Heart Journal* (2024). [DOI: 10.1093/eurheartj/ehae100](https://doi.org/10.1093/eurheartj/ehae100)

Provided by Queen Mary, University of London

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