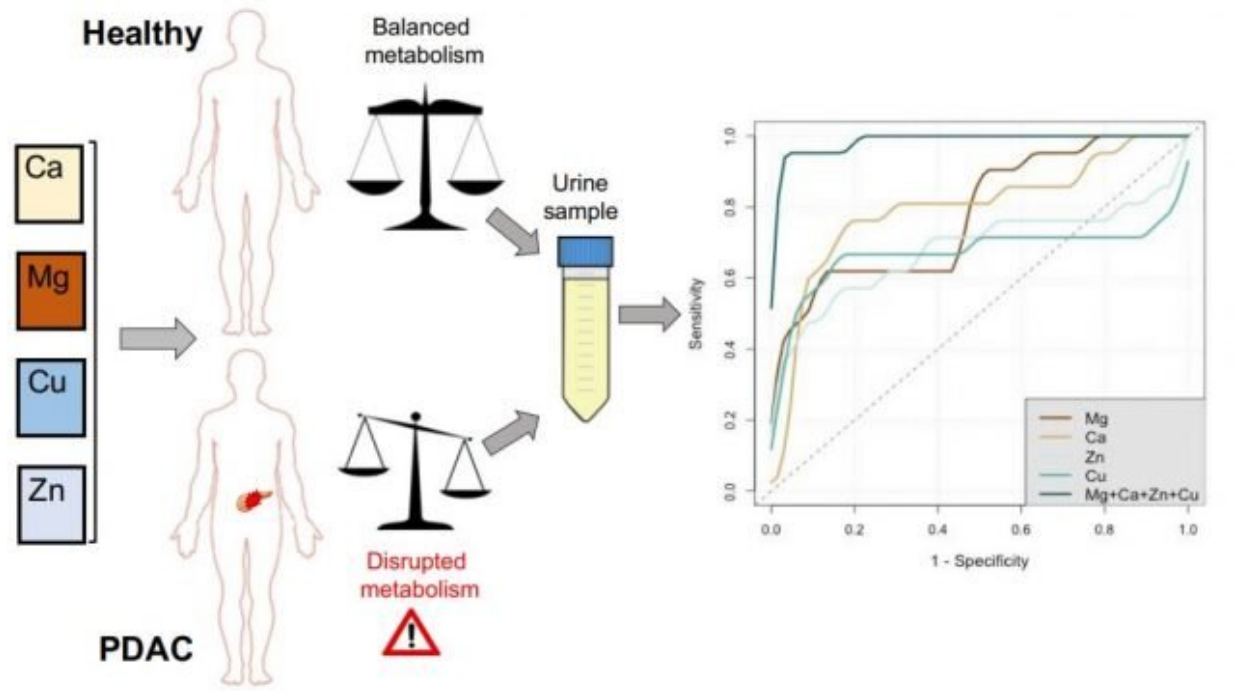
Metal in urine provides potential noninvasive test for pancreatic cancer

April 27 2020



Credit: State of the Planet

New research has revealed that the signature of metal ions present in urine samples is an accurate indicator of pancreatic ductal adenocarcinoma (PDAC), one of the deadliest types of cancer.

The discovery could signal the possibility of a new and completely noninvasive test for pancreatic cancer, of which PDAC is by far the

most common form. Although it accounts for only 2.5 percent of new cancer cases, pancreatic cancer leads to 6 percent of cancer deaths worldwide each year, because the mortality rate is so high, at around 85 percent. No tests for early detection are currently available, and as symptoms are usually nonspecific, PDAC is normally diagnosed at a late stage when it is already locally advanced or has spread to other parts of the body. Any improvement in tests for early detection would therefore represent a breakthrough.

The study, published in the journal *Metallomics*, took as its starting point the fact that cancer leads to changes in biochemical reactions within the body. These changes, if measurable, can be powerful tools for detection. The research team discovered that PDAC patients had significantly lower levels of urinary calcium and magnesium, and increased levels of copper and zinc, when compared to healthy controls. A combined analysis of these essential metals was shown to be an accurate indicator of biochemical changes related to PDAC. The team also found that the urine of PDAC patients has higher levels of a particular isotope of zinc compared to healthy controls.

Lead author Kathrin Schilling, who did the work while at the University of Oxford, said, "As urine samples can be taken time and time again in a noninvasive way, we can start to talk about an effective method to screen and monitor high-risk groups for pancreatic cancer. Our results show that developing new science crossing interdisciplinary boundaries can address really important needs in medicine." Schilling is now based at Columbia University's Lamont-Doherty Earth Observatory.

The study's senior author, Tatjana Crnogorac-Jurcevic from Queen Mary University London, said, "We are very excited about our findings, and hope that we will be able to continue this work and further validate obtained results."

The researchers say the next step will be to study the levels of metals in a larger number of urine samples as well as in prediagnostic urine samples, to see if changes in their levels can be detected before the symptoms of cancer appear. If the results are still promising, the metal biomarkers will then be tested in a real clinical scenario. Researchers at Barts Cancer Centre, who coauthored the new study, have already embarked on a study of protein biomarkers in the urine of PDAC patients.

Other research groups involved were the Lamont-Doherty lab of Alex Halliday, director of Columbia's Earth Institute; and the Department of Pediatrics and Pediatric Infectious Diseases at Russia's Sechenov First Moscow State Medical University.

More information: Kathrin Schilling et al. Urine metallomics signature as an indicator of pancreatic cancer, *Metallomics* (2020). DOI: 10.1039/D0MT00061B