

NTU scientists develop probes that can detect acute kidney failure faster



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Above: The probes, when added to a urine sample with biomarkers that indicate the onset of acute kidney failure, light up when exposed to UV light. PHOTO: NANYANG TECHNOLOGICAL UNIVERSITY

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Nanyang Technological University (NTU) scientists have developed imaging probes that light up when acute kidney failure is detected, which will help spot the condition 11/2 days faster than other real-time molecular imaging methods.

The probes, which are injected into the bloodstream, light up due to a chemical reaction when they detect molecular changes caused by the onset of acute kidney failure.

They have been tested on mice and human trials start next year.

Acute kidney failure usually occurs in a few hours or a few days, and is most common among patients who are critically ill and need intensive care.

In 2015, 1,619 people in Singapore were diagnosed with kidney failure, the main cause being diabetes.

Current diagnostic platforms are unable to detect early-stage, pre-morbid changes that underlie acute renal failure, said Associate Professor Pu Kanyi from NTU's School of Chemical and Biomedical Engineering.

These platforms include the serum creatinine test, which measures the level of creatinine in the blood and provides an estimate of how well the kidneys filter, and the blood urea nitrogen test, which measures the amount of urea nitrogen in the blood. Higher-than-normal urea nitrogen levels suggest the kidneys or liver may not be working properly.

In contrast, the probes are sensitive enough to track changes in the biological processes triggered by the onset of acute kidney failure.

"For patients who are critically ill, such as those in the intensive care unit, every minute is precious in reversing a condition such as acute kidney failure, which can cause a patient's health to deteriorate rapidly," he said.

When tested on mice, the probes lit up 12 hours after the cancer drug cisplatin was given at a level destructive to the kidneys - 11/2 days faster than other real-time molecular imaging methods.

The findings were published in the scientific journal Nature Materials in May.

Prof Pu said there is a possibility of developing the probes into test strips for urine samples, making it a non-invasive method of detecting acute kidney failure.

The probes were found to have high renal clearance - more than 97 per cent of the probes injected into mice flowed through the kidneys and were excreted as part of urine.

When added to the urine sample and incubated for a few hours, the probes light up when exposed to UV light in the presence of biomarkers.

The team has filed a Singapore patent for the technology.

Their next phase involves working with medical institutions to further refine the probes.

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