

NTU scientists create new method to detect acute kidney failure early – and it could help stop the disease in its tracks

Jonathan Loh

July 11, 2019



The probes, which are added to a urine sample with biomarkers that indicate the onset of acute kidney failure, light up when exposed to UV light. NTU Singapore

A team of scientists from Nanyang Technological University (NTU) have engineered a luminescent imaging probe that enables early diagnosis of acute kidney failure – a rapidly-developing fatal condition.

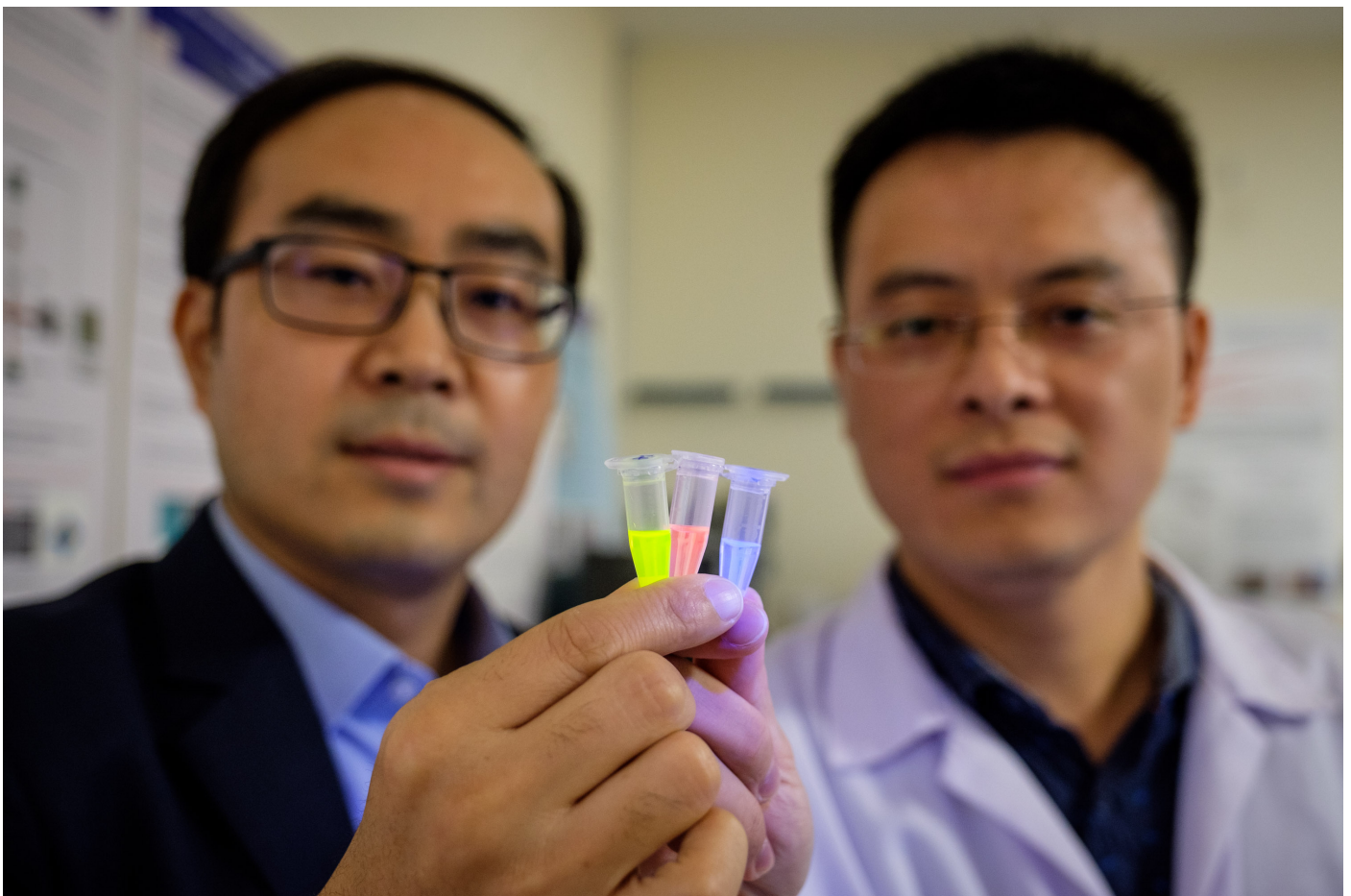
The university said in a [news release](#) on Thursday (July 11) that [the new probes](#) – first tested in mice – are injected into the bloodstream and illuminate when molecular changes triggered by the onset of acute kidney failure are detected.

As acute kidney failure typically occurs in a few hours or days and in patients who are critically ill and require intensive care, the university said that current diagnostic platforms fail to detect the “early stage, pre-morbid changes” that underlie the disease.

However, the imaging probes developed by the team are said to be sensitive enough to track changes in biological processes that are characteristic of a kidney that has shut down.

The team’s research leader, associate professor Pu Kanyi from NTU School of Chemical and Biomedical Engineering, said the probes are able to “follow” these subtle changes in the body at the molecular level and could help to arrest the development of the disease, something that current diagnostic methods fall short of.

Pu said, “For patients who are critically ill, like those in the intensive care unit, every minute is precious in reversing a condition like acute kidney failure, which can cause a patient’s health to deteriorate rapidly.”



The probes are able to detect subtle biological changes at the molecular level. NTU Singapore

When the probes were tested on mice models with drug-induced acute kidney failure, the onset of the condition was reportedly detected 1.5 days earlier than current molecular imaging methods.

A Singapore patent has been filed for the technology, NTU said.

Paving the way for non-invasive checks

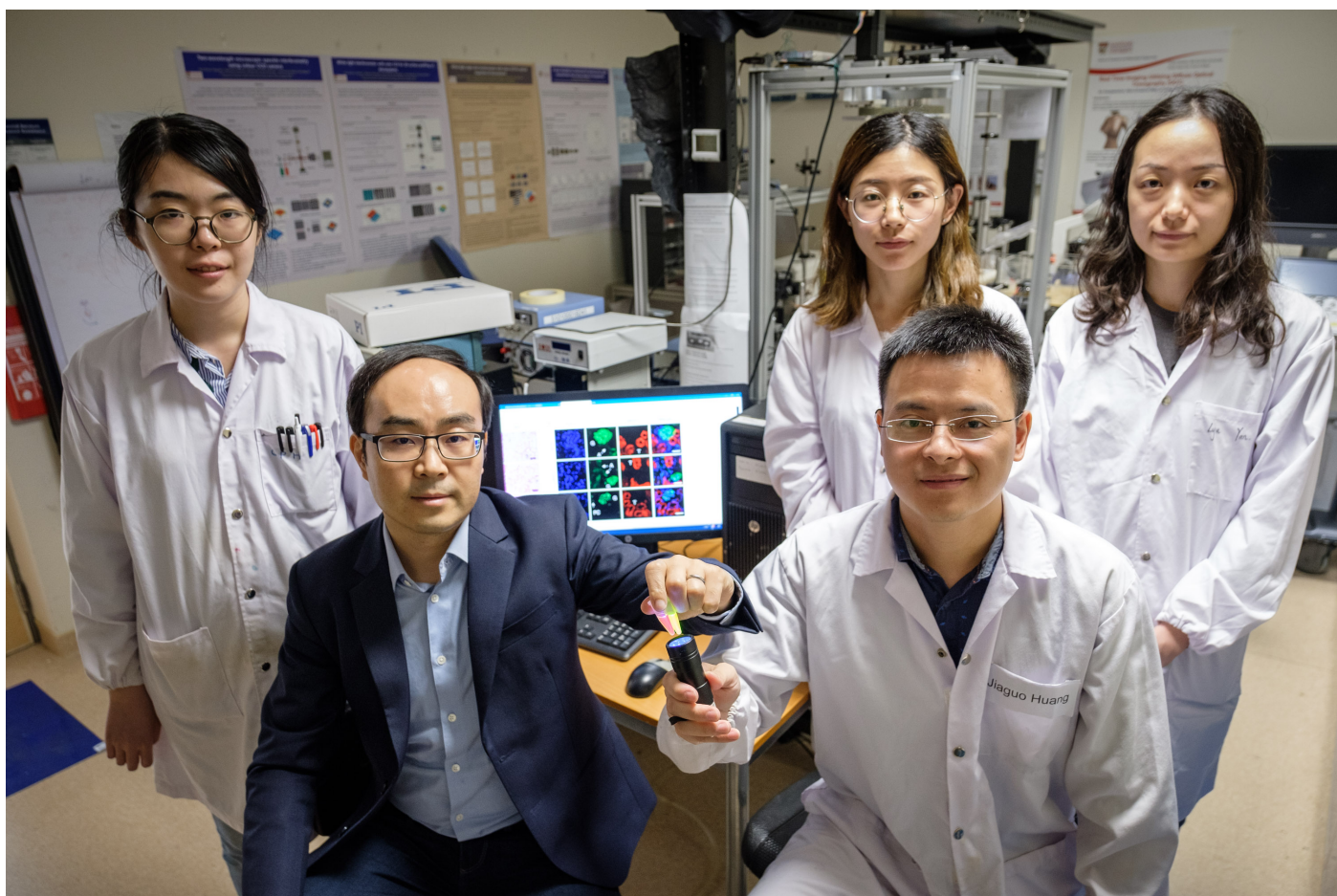
According to the university, the probes were used on mice that were given a “destructive level” of cancer drug called cisplatin. The probes lit up after twelve hours, indicating the detection of a change in the biomarkers linked to acute kidney injury.

This was consistent with the renal tubular damage that was measured in the mice three days after cisplatin was administered, NTU said.

The probes also showed “high renal clearance” as more than 97 per cent of the injected dosage were observed to have flowed through the kidneys and subsequently excreted in urine.

This newfound property bodes well for using the probe directly on urine samples, Pu said, noting that when the probes are added to a urine sample and incubated for a few hours, they will illuminate when exposed to ultra-violet (UV) light in the presence of biomarkers.

He said: “This opens up possibilities of developing these probes as test strips for urine samples, making it a potential non-invasive way of checking for acute kidney failure in the future.”



Associate professor Pu Kanyi (second from left in black) and his team from the NTU School of Chemical and Biomedical Engineering have developed a type of molecular renal probe that holds promise for the early detection of acute kidney failure. NTU Singapore

The team plans to focus on further refining the probes with urine samples from critically ill patients in its next phase of research, during which the scientists will be collaborating with local and overseas medical institutions.