NTU develops non-invasive probes to detect acute kidney failure in early stage

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July 11, 2019 15:50 +08

Nanyang Technological University (NTU) scientists have developed a type of imaging probe that is expected to detect an early stage acute kidney failure, which develops rapidly and could be fatal.

Developed by Associate Professor Pu Kanyi and his team from NTU, the unique renal probes have been tested in mice while injecting it into the blood stream and light up after detecting molecular changes caused by the onset of acute kidney failure.

It should be noted that these probes can be used in test strips for urine samples, making it a non-invasive method of detecting renal failure. After creating these probes, which are made up of three components, they were injected into mice after giving them a cancer drug at a level dangerous to the kidneys. Apart from the detection ability by the probes, the team also found that they have high renal clearance efficiency, usable directly on urine samples.

AS per Prof Pu the molecular renal probes are useful for those patients who are in very critical condition. He also believes that these could be used in an intensive care unit setting, where early detection of such disease is paramount to a patient's survival.

It should be noted that current diagnostic platforms are unable to detect early-stage, pre-morbid changes that underlie acute kidney failure. But NTU's molecular imaging probe is claimed to be sensitive enough to track changes in the biological processes triggered by the onset of the condition.

After the probes were tested on mice with drug-induced acute kidney failure, the researchers noticed that these detected the onset of the condition one and a half days earlier than current molecular imaging procedures.

To make sure the molecular renal probes track the right signals and biological processes, the research team first identified the reactive oxygen species (ROS), which are chemically unstable molecules that serve as early-stage biomarkers for kidney injury.

It should be noted that an imbalance in ROS leads to damage in the body's fatty tissues, DNA, and proteins, which can trigger cell death in an organ and renal fibrosis, in which kidney injury can't be healed.

Associate Professor Pu Kanyi, who is from the NTU School of Chemical and Biomedical Engineering, said: "Many reports have shown that ROS-induced by-products are dysregulated in the plasma or urine before acute kidney injury occurs. This implies that direct ROS detection could identify acute kidney failure earlier."