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Researchers in Singapore grow ‘mini kidneys’ in lab, paving way for potential kidney disease therapies

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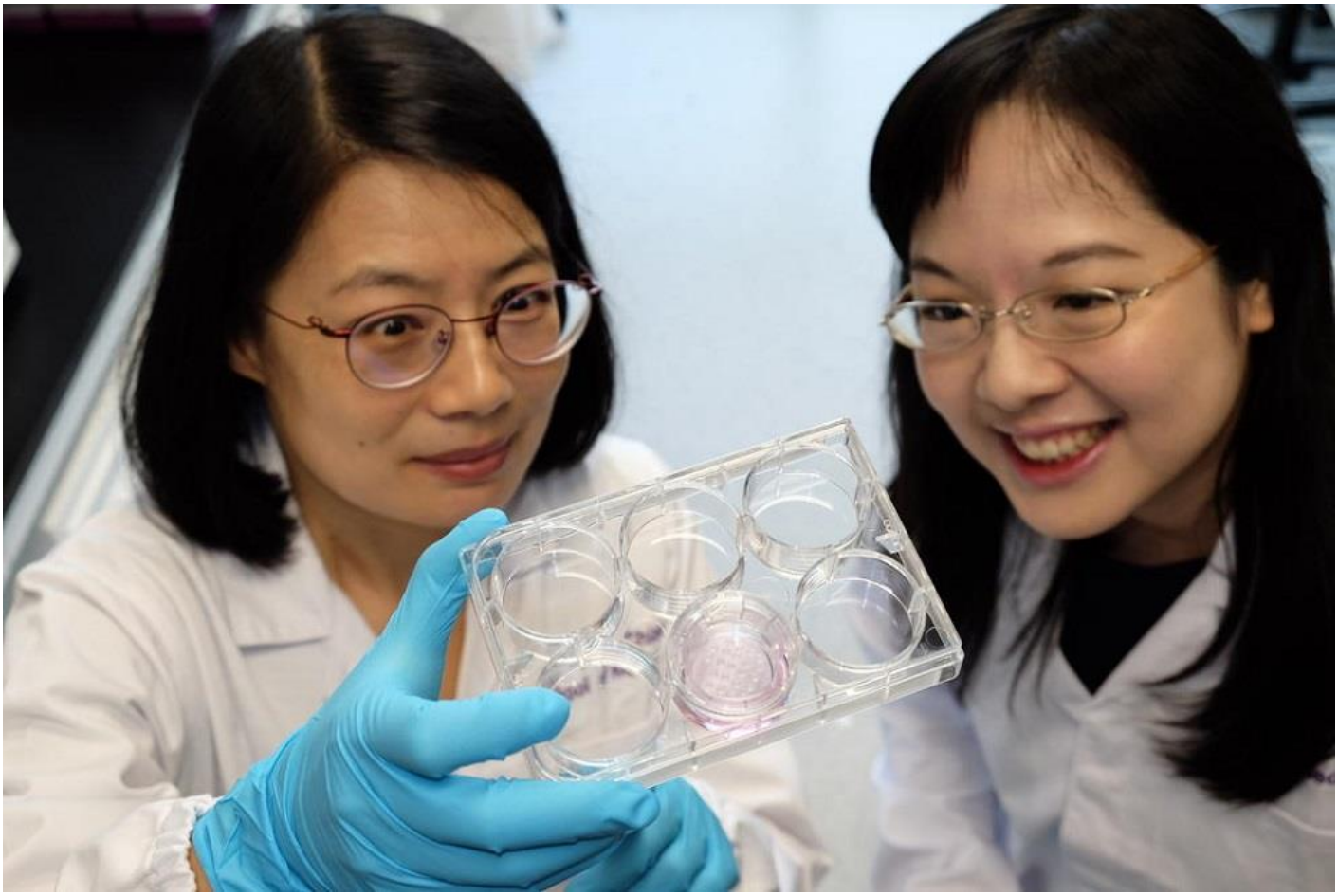


The research on ‘mini kidneys’ was led by Nanyang Technological University Assistant Professor Xia Yun (left) and her team, which includes NTU Asst Prof Foo Jia Nee (right). — Picture courtesy of NTU Singapore via TODAY

SINGAPORE, Aug 22 — Patients with kidney disease could eventually benefit from “mini kidneys” grown in a laboratory by an international team of researchers led by Nanyang Technological University (NTU), the university said on Tuesday.

These mini kidneys — derived from the patient’s cells — could be used to test certain drugs and help researchers better ascertain which treatment plans a patient with kidney disease needs, NTU said in a media statement.

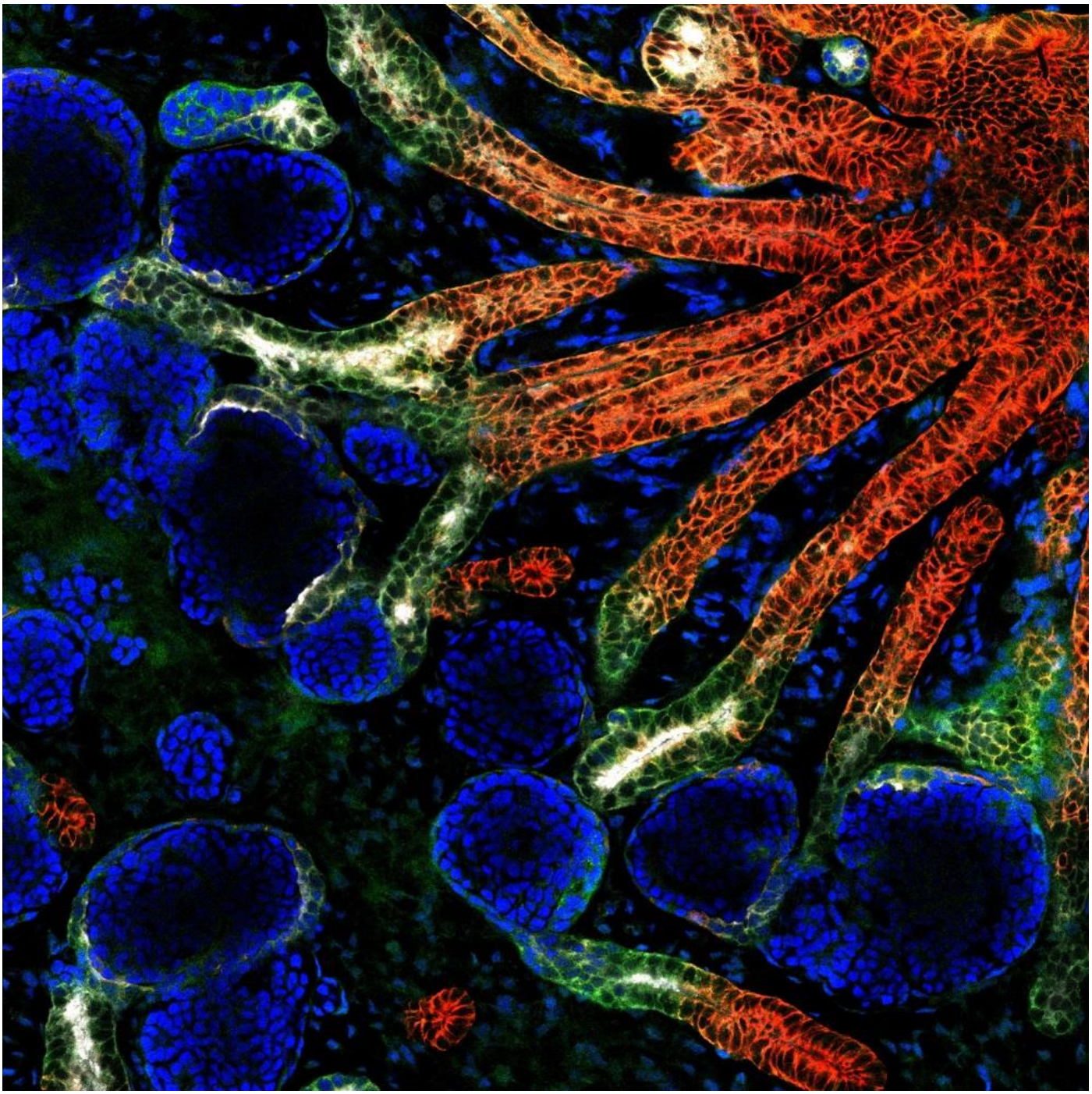
Tailoring treatment to an individual patient is important as genetic errors that cause kidney failure differ from patient to patient, NTU said.

Using the mini kidneys to test the therapeutic effects of drugs removes the need to carry out drug screening on the patients themselves, it added.

The researchers grew the kidney “organoids” — a miniature version of an organ — from skin cells of patients with a common inherited cause of kidney failure known as polycystic kidney disease, a genetic disorder where multiple cysts develop within the kidney. The mini kidneys measured 1mm to 2mm in diametre.

The cells were grown outside the body in a laboratory and were “reprogrammed” to obtain pluripotent — or self replicating — stem cells, which, under the right conditions, can develop into the mini kidneys, which are similar to human foetal kidneys.

In growing the mini kidneys from the induced stem cells, the research team said it has “paved the way for tailoring treatment plans specific to each patient, which could be extended to a range of kidney diseases’’.



This immunofluorescence image shows the preliminary development of structures in a kidney organoid at day 24. — Picture courtesy of NTU Singapore via TODAY

NTU Singapore Assistant Professor Xia Yun, who led the research, said: “Our kidney organoids, grown from the cells of a patient with inherited polycystic kidney disease, have allowed us to find out which drugs will be most effective for this specific patient.”

Dr Xia, who is from the NTU Lee Kong Chian School of Medicine (LKC Medicine), added that this approach could be extended to study many other types of kidney disease, such as diabetic nephropathy — kidney damage that results from having diabetes.

Professor Juan Carlos Izpisua Belmonte, a stem cell scientist and an international collaborator on this study, said: “We are still quite far away from using these kidney organoids for replacement therapy.” But the research represents “a small step closer to this ultimate goal”, he noted.

Prof Belmonte is based at the Salk Institute for Biological Studies in San Diego, California.

New insights into kidney development

While the origin of kidney blood vessel networks is not fully known, the examination of cells within a kidney organoid has led Dr Xia’s team to discover a new source of stem cells — called nephrons — that contribute to making these blood vessel networks.

NTU LKC Medicine Assistant Professor Foo Jia Nee said that these nephrons can be better used to understand the kidney’s development from birth, where being born with higher nephrons appears to “provide some degree of protection” against hypertension and kidney failure later in life.

Dr Xia added: “A thorough understanding of human embryonic kidney development may help us develop ways to promote a high birth nephron number for foetuses as they develop during pregnancy.”

The research was published in the July edition of *Cell Stem Cell*, a United States-based scientific journal. — TODAY