

# Research on Polycystic Kidney Disease shows remarkable progress in the treatment of Mini Kidneys

BY [CLAIRE REID](#) | WED, 10 APR 2024 AT 00:52:14 |

Immunofluorescence scans of organoids caused by polycystic kidney disease are being supported by NTU Singapore excepting one.

Minoxidil is proving to be a promising treatment option for polycystic kidney disease, according to a pioneering study conducted by NTU Singapore on 'mini kidneys'.

The cultivation of "mini kidneys" in the laboratory and the subsequent implantation of these cells in live mice have resulted in new insights into metabolic deficiencies and a possible treatment for polycystic kidney disease, as discovered by scientists at NTU Singapore.

Using stem cells, kidney organoids, commonly referred to as 'mini kidneys', are grown in the laboratory and are utilized as a primary source of kidney-like structures.

End-stage kidney disease is common among individuals with PKD, typically occurring in their 50s or 60s, and treated options include dialysis or a kidney transplant. However, dialysis poses significant risks and a larger cost than a transplanted kidney. The FDA's Tolvaptan, which has severe liver effects, is an expensive alternative.

This image shows enlarged microscopic cystic kidney organoids produced by patient-induced pluripotent stem cells kindly provided by NTU Singapore.

The NTU research team initiated the engrafting of their newly developed mini kidneys into mice to enhance the understanding of PKD and help patients in their clinical trials.

Previous research focused on growing mini kidneys in a dish, which could only partially mimic kidney structure and function. However, backing live mice was the next step in replicating the pathological features of kidney disease through engrafting them.

The study of polycystic kidney disease was facilitated by the use of engrafted mice, which replicated critical disease characteristics similar to those seen in human kidney patients, as stated by lead investigator Assistant Professor Xia Yun at LKC Medicine.

The kidneys displayed certain significant disease symptoms, such as spontaneous cyst formation and damage to its small tubes.

Researchers at NTU Singapore's L adica "Leading Room" is where the LKC Medicine research team is seated. The research team consists of Liu Meng, Dr Zhang Chao, Assistant Professor Foo Jia Nee, and Assistant Professor Xia Yun.

In a study published in the Cell Stem Cell journal, the NTU research team concluded that the mini kidneys produced by their engrafted method were of exceptional quality, because cysts produced during mechanical stimulation were not stimulated by additional stress or chemicals, even after removal of cysts from live mice for further experiments in a dish, while previous kidney organoids grown in a dish cannot form cysts without stress stimulation, despite their high quality.

The presence of disease sieben times more frequent in the UK than in the US suggests that growing kidney organoids and engrafting them into live mice could be useful in studying and testing new treatments.

Although it is well established for many years, the creation of cysts in the kidneys is frequently associated with abnormalities in the primary cilium, but no research has been conducted on the primary cilium's regulatory mechanism or autophagy relationship in live mice with PKD.

The PKD development in live mice was studied and cellular pathways were tested, leading to the conclusion that enhancing autophagy could lessen the severity of cysts in the mini kidney.

The NTU researchers selected 22 drugs with varying effects on cell metabolism that they believe could reduce cysts by encouraging autophagy. They conducted a test at the lab and discovered that minoxidil, boasting of its long-term use as a clinical drug for hair loss and hypertension, significantly decreased cyst formation in the new mouse model.

According to research, Asst Prof Xia Yun, the reduction of cysts in polycystic diseased kidneys through increased autophagy can be a promising treatment option for PKD.

The development of models in live organisms has led to increased opportunities to explore alternative treatments for kidney failure, as noted by Associate Professor Ng Kar Hui, Senior Consultant, Division of Paediatric Nephrology, Dialysis and Renal Transplantation, Khoo Teck Puat – National University Children's Medical Institute, National University Hospital, in his statement.

The NTU team plans to use minoxidil for future studies and modify the mini kidney models to investigate other increasing kidney diseases without a specific genetic cause, such as diabetic kidney disease.

What should be written?

A study of 10 human Korean Korean researchers suggests that the cilium-autophagy metabolic axis could be a therapeutic target for human PKD diagnosis in vitro and in vivo.