

Researchers have successfully changed blood type of donor kidneys

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This image shows a cross section of a kidney. Credit: Holly Fischer/Wikipedia

Researchers at the University of Cambridge have successfully altered the blood type on three deceased donor kidneys in a discovery that could have major implications for kidney patients.

The project could increase the supply of kidneys available for [transplant](#), particularly within ethnic minority groups who are less likely to be a match for the majority of donated kidneys.

Professor Mike Nicholson and Ph.D. student Serena MacMillan used a normothermic perfusion machine—a device which connects with a human kidney to pass oxygenated blood through the organ to better preserve it for future use—to flush blood infused with an enzyme through the deceased kidney.

The enzyme acted like "molecular scissors" to remove the blood type markers that line the blood vessels of the kidney resulting in the organ being converted to the most common O type.

A kidney from someone with an A blood type cannot be transplanted to someone with a B blood type, nor the other way around. But changing the blood type to the universal O will allow more transplants to take place as O can be used for people with any blood group.

"Our confidence was really boosted after we applied the enzyme to a piece of human kidney tissue and saw very quickly that the antigens were removed," said MacMillan.

"After this, we knew that the process is feasible, and we just had to scale up the project to apply the enzyme to full-size human kidneys. By taking B type human kidneys and pumping the enzyme through the organ using our normothermic perfusion machine, we saw in a matter of just a few hours that we had converted a B type kidney into an O type."

The discovery could be particularly impactful for people from ethnic minority groups who often wait a year longer for a transplant than Caucasian patients.

People from [minority communities](#) are more likely to have B type blood and with current low donation rates from these populations, there are simply not enough kidneys to go around. In 2020/21, just over 9% of total organ donations came from black and minority ethnic donors whilst black and minority ethnic patients make up 33% of the kidney transplant waiting list.

The Cambridge team now need to see how the newly changed O type kidney will react to a patient's usual blood type in their normal blood supply. The perfusion machine allows them to do this before testing in people, as they can take the kidneys which have been changed to the O type, use the machine to introduce different blood types and monitor how the kidney might react, simulating the process of transplant into the body.

"One of the biggest restrictions to who a donated kidney can be transplanted to is the fact that you have to be blood group compatible," said Nicholson, professor of transplant surgery.

"The reason for this is that you have antigens and markers on your cells that can be either A or B. Your body naturally produces antibodies against the ones you don't have.

"Blood group classification is also determined via ethnicity and ethnic minority groups are more likely to have the rarer B type. After successfully shifting [blood group](#) to the universal O type, we now need to look at whether our methods can be successful in a clinical setting and ultimately carried through to transplantation."

Dr. Aisling McMahon, executive director of research at Kidney Research U.K. said, "The research that Mike and Serena are undertaking is potentially game-changing. It is incredibly impressive to see the progress that the team has made in such a short space of time, and we

are excited to see the next steps.

"As an organization, we are committed to funding research that transforms treatments and tackles health inequalities. We know that people from minority ethnic groups can wait much longer for a transplant as they are less likely to be a [blood-type](#) match with the organs available. This research offers a glimmer of hope to over 1,000 people from minority ethnic groups who are waiting for a kidney," McMahon said.

After testing the reintroduction of other blood types, the team in Cambridge will look at how the approach might be used in a clinical setting. Having made great progress in such a short space of time they are hopeful for the future.

The full paper on Mike and Serena's work is set to be published in the *British Journal of Surgery* in the coming months.

Ayesha was diagnosed with stage three [chronic kidney disease](#) in 1998 when she was pregnant with her first child.

She didn't think much of it while she enjoyed her time being a mother, but her kidneys deteriorated rapidly during the pandemic.

She was told that she would need a transplant, but she might have to wait double or even triple the time for a kidney than a Caucasian person. Consultants estimated that she might have to wait between six to ten years to receive one.

Ayesha said, "They explained that because of my ethnicity my wait for a deceased donor will be longer than for a white person. The reason being my background—being the Muslim community and other faiths and cultures often don't agree to be organ donors.

"I feel sad at the thought of waiting so long for a transplant, I understand a transplant isn't a cure, but it would make my body a lot stronger and give me a second chance at a healthy life."

She has recently started volunteering for Kidney Research U.K. under the charity's peer educator scheme, a program that recruits trusted members of the community to talk openly about kidney disease.

"In the Muslim communities, [kidney](#) disease is common yet still a taboo subject at the same time," said Ayesha.

"People's religious beliefs play an imperative role in making life-changing decisions. Even after the law change so everyone was automatically made an organ donor, many people decided to opt out.

"The research will offer so much hope to minority groups still waiting for a transplant and could help to save many lives. Convincing communities that research such as this and organ donation is beneficial is so crucial to improving and saving lives."

Ayesha continues to hope for a donor and hopes that through her education, more people will come forward and offer her, and others like her, the chance at a better life.

Provided by University of Cambridge

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