

Human lungs rejected for transplant recovered using novel technique

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Matthew Bacchetta, MD, MBA, associate professor of Thoracic Surgery and adjunct associate professor of Biomedical Engineering at Vanderbilt University Medical Center. Credit: Vanderbilt University Medical Center

A multidisciplinary team from Vanderbilt University Medical Center (VUMC) and Columbia University has demonstrated that injured human donor lungs declined for transplant can be recovered by cross-circulation

between the human lung and a xenogeneic host.

The new technique, described in a study published recently in *Nature Medicine*, has the potential to increase the supply of donor lungs available for [transplant](#), saving the lives of people who would otherwise die while waiting on the transplant list.

Lungs are the least-used solid organ for transplant because only 20% of donor lungs are considered to be in sufficient condition for transplantation, said author Matthew Bacchetta, MD, MBA, associate professor of Thoracic Surgery and adjunct associate professor of Biomedical Engineering at VUMC.

"If we could improve the 20% acceptance rate and increase it to 40% or 50% acceptance rate, we would essentially eliminate our waitlist and we would actually be able to open up transplantation to more people," Bacchetta said.

Bacchetta and his colleagues proved in earlier published research that a cross-circulation technique using an animal model can not only support but rehabilitate animal lungs for up to four days. The current research extends that success to human lungs considered too damaged for transplant, preserving them for 24 hours using the xenogeneic platform.

Lung disease is the third leading cause of death globally, and transplantation is the only definitive cure for patients who are in the end stage of the disease. The current standard of care for donor lungs is ex vivo lung perfusion (EVLP), a mechanical support system that can preserve lungs for up to eight hours but has limited means to rehabilitate them. The study demonstrated that a lung that failed to improve on EVLP could be rehabilitated using the xenogeneic platform.

"Unquestionably, EVLP has been a game changer for lung

transplantation, but it remains limited in its capacity to resuscitate severely injured lungs," Bacchetta said. "We knew this was our benchmark study, a [human lung](#) that failed state of art treatment with EVLP. If we could make this work on our system, then we were on the right path. It was a eureka moment for our team."

The xenogeneic platform offers scientists two immediate research pathways, Bacchetta said. First, it offers a new option for transplanting lungs previously considered too damaged for transplant. Secondly, the xenogeneic platform allows lungs to be preserved to test further therapeutic interventions as well as investigations in drug discovery, testing and delivery. Further, the cross-circulation platform may be used to recover other human organs and tissue, including livers, hearts and kidneys as well as limbs.

"For those of us who work with patients every day, there is a sense of urgency to improve organ quality, availability and patient access," Bacchetta said. "Cross-circulation may ameliorate the donor shortage so more patients with end-stage [lung](#) disease can benefit from transplantation."

"This is another in a series of breakthroughs by Dr. Bacchetta and his team that have [profound implications](#) for patient care and offer hope to patients who would otherwise die waiting for an organ," said Seth Karp, MD, H. William Scott Jr. Professor, chair of the Section of Surgical Sciences and director of the Vanderbilt Transplant Center.

More information: Xenogeneic cross-circulation for extracorporeal recovery of injured human lungs , *Nature Medicine* (2020). [DOI: 10.1038/s41591-020-0971-8](https://doi.org/10.1038/s41591-020-0971-8)

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