

## Pig-to-Human Organ Transplant

Jan. 31<sup>st</sup>, 2022

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On October 24, 2021, I was looking at an article in a medical journal as usual, and it astounded me. I found an article about pig kidney transplantation to a brain-dead person without any reject response<sup>1</sup>(1). I immediately contacted a friend. His concerns are about the clinical research using brain-dead person rather than pig kidneys. However, he was aware of scientific development. Less than half a year later, I found an article about pig heart transplantation to humans<sup>(2)</sup>. I am amazed at the rapid progress in science and technology.

I'm sure many patients want organ transplantation, even though it is a pig organ. Such research is that many patients are on the long waiting list for transplants due to the difficulty of collecting organs for transplantation. According to a report by the Japan Organ Transplant Network<sup>(5)</sup>, as of the end of 2021, there were 923 patients registered for heart transplants, 477 for lung transplants, 332 for liver transplants, 13738 for kidney transplants, 1,097 for pancreas, and 10 for small intestine.

Transplantation of organs from animals has a long history of y. Pig organs seem to be similar to human organs within animals. Still so, it was not possible to perform transplants due to difficulties such as rejection. However, recent gene-editing technology made it possible to change pig genes to make it possible to create organs less likely to be rejected. At the same time, it is devised that the transplanted organ does not grow too large. In October 2021, there was AP news on the successful transplantation of pig kidneys to brain-dead patients without rejection<sup>(1,3,4)</sup>. In 2022, Nature's report of a heart transplant case<sup>(2)</sup>. Everyone would agree that there is a need to verify whether there are any ethical or social issues with such research. Some patients require organ transplantation for treatment. Many aspects make it unreasonable. It would be better if there were any drugs, but it is impossible. It would be better if human organs could be transplanted, but it takes a long time. Many cases die before implementing organ transplantation. It is easy to imagine that this is the reason why this kind of organ transplant is allowed. However, many people still raise ethical and social issues. For example, (1) How much does it cost? (2) What will be done with the pigs after the heart and other necessary organs are removed? Are the pigs for food for humans or animals? We will have a similar discussion as with

genetically modified food. US regulators approved genetically modified pigs for food and drugs(6). (3) If the pigs are released into the environment, what would happen to them and us? (4) What kind of effects will occur on humans who receive the transplants? These issues make us consider that the pigs for organ transplantation, their organs, and the patients who transplanted pig organs must be strictly controlled and monitored. It would be outrageous to use the pigs and their organs for food. The follow-up of transplant patients will probably be for a long time, 20 to 50 years. In some cases, it may be for as long as they live. What about how to stock and deliver pig organs? These also seem to be a big issue. What happens if pig organs develop deformities or abnormalities? How about oncogenesis? How about an allergic reaction? And so on. There are still many issues that need to be discussed. However, as many patients wait for organ transplants, it is desirable to take action as soon as possible, making new guidelines and so on.

source:

- 1) [Pig-to-human transplants come a step closer with new test](#). AP News October 21, 2021.
- 2) [First pig-to-human heart transplant: what can scientists learn?](#) Nature January 14, 2022.
- 3) [Pig Kidneys Transplanted to Human in Milestone Experiment](#): Scientific American January 20, 2022.
- 4) "First clinical-grade porcine kidney xenotransplant using a human decedent model" by Paige M. Porrett, Babak J. Orandi, Vineeta Kumar, Julie Houp, Douglas Anderson, A. Cozette Killian, Vera Hauptfeld-Dolejsek, Dominique E. Martin, Sara Macedon, Natalie Budd, Katherine L. Stegner, Amy Dandro, Maria Kokkinaki, Kasinath V. Kuravi, Rhiannon D. Reed, Huma Fatima, John T. Killian Jr., Gavin Baker, Jackson Perry, Emma D. Wright, Matthew D. Cheung, Elise N. Erman, Karl Kraebber, Tracy Gamblin, Linda Guy, James F. George, David Ayares and Jayme E. Locke, *American Journal of Transplantation* January 20, 2022.  
[DOI: 10.1111/ajt.16930](https://doi.org/10.1111/ajt.16930)
- 5) Homepage of Japan Organ Transplant Newok. ( <https://www.jotnw.or.jp/data/> )
- 6) [US regulators OK genetically modified pig for food, drugs](#). AP News December 16, 2020.

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