

(XENO)TRANSPLANTATION AND AN INTEGRAL ECOLOGY

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Currently, there are more than 100,000 patients on the national transplant waitlist, with less than 50,000 transplants performed in 2024.¹ This statistic is neither unusual nor a sign of a cultural shift in organ transplantation. Instead, the current mismatch between patients on the transplant waitlist and the number of organs transplanted is a reminder of the chronic organ shortage that has defined transplant medicine for decades. Addressing such a shortage has been no small task, and despite continued innovation and progress in transplant medicine, the shortage continues.

Xenotransplantation (XTx), which involves the use of nonhuman animal organs or tissue in humans, has emerged as a potential solution to the chronic organ shortage. With its modern origins in the 1960s, current XTx efforts have focused on the use of genetically modified pigs to procure organs that are compatible with use in humans.²

In 2022, a patient survived about two months after receiving a genetically modified pig heart, and in recent years several transplants of genetically modified pig kidneys have resulted in relative success.³ Most of these attempts at XTx have occurred through FDA compassionate-use applications, however, the first FDA-approved XTx clinical trial for xenokidney transplantation was announced in 2025.⁴

Despite concrete progress in XTx, many clinical and ethical uncertainties remain. But the potential for XTx to help improve the chronic organ shortage points to the need for ongoing ethical reflection.

Current ethical reflection on XTx has primarily focused on whether there is an appropriate balance of risk and benefit, potential obstacles to informed consent in XTx research, concerns for animal welfare, and the need for equitable participant selection.⁵ Turning to the Catholic tradition for additional insight can help to further illuminate these ethical concerns and point to more expansive moral commitments in the context of XTx.

EVALUATING XTx THROUGH A CATHOLIC LENS

Within the U.S., the Uniform Anatomical Gift Act proscribes the buying and selling of human organs and tissue for transplantation.⁶ Instead, altruistic gift is the desired foundation for the organ transplantation system — we are asked to give the “gift of life” by registering as an organ donor. While an ethic of gift remains important for donors, procured organs are scarce medical resources and are allocated within a framework that recognizes them as such. For these reasons, efficiency and equity have become the predominant ethical principles in organ allocation.⁷

XTx has the potential to not only fundamentally challenge the existing system of organ allocation, but to uproot it. Companies who have developed and invested in XTx expect a market return — if XTx makes its way into clinical practice, at least some patients will receive (pig) organs through the market economy rather than through the “market of gift.” In this way, XTx challenges us to reconsider our organ allocation system and to consider how disparities in organ allocation might be positively or negatively impacted by the acceptance of XTx.

For Pope John Paul II, it is this ethic of self-giving to the other that justifies and makes admirable the practice of organ donation.⁸ This approach requires that organ donation avoid pure utilitarianism and instead faithfully match organs on the basis of “immunological and clinical factors.”⁹ The good(s) of medicine, for the Catholic

tradition, are those that attend to the integral good of the human person — a person in their totality, not just their biological and physiological aspects.

Returning to XTx, the question for the Catholic tradition is not just can we pursue it, or even should we, but a question that asks, “Why are we pursuing XTx?” Whether clinical applications of XTx — along with the research necessary to support it — uphold the integral good of the human person still requires further examination.

Pope John Paul II stated that, in principle, XTx can be licit so long as the genetic and physiological identity of the person is not compromised and recipients are not exposed to disproportionate risk.¹⁰ The Pontifical Academy for Life similarly evaluates XTx and interrogates the meaning of such human interventions into the created order.¹¹ An ethical appraisal of XTx requires a complex consideration of both Catholic anthropology and ecology.

XTx AND THE MORAL DEMANDS OF INTEGRAL ECOLOGY

Ultimately, because we are human persons, made in the image and likeness of God, all things, medicine included, are to be ordered toward our integral good. Because we are human persons, gifted with rationality, we are given dominion over the created world — a world God made and saw as “good.” (Genesis 1:25-26)

Pope Francis reminded us of our special obligation to the created world, our common home: There is an integral ecology, one which locates human persons and societies within our broader contexts.¹² The integral good of the human person cannot be understood or achieved separately from the broader good of our common home. In considering XTx, especially in the potential for the industrial farming of pigs for their organs, this reality is owed special consideration.

While the use of animals to further the good of humans is broadly permissible — even, some argue, within XTx¹³ — there are definite obligations toward the animals involved. Such an attention to an integral ecology also serves to remind us of what Pope Francis coined the technological paradigm: Unexamined progress is no good in itself; the purpose of technology requires scrutiny and communal consideration.¹⁴ A Catholic conception of XTx requires consideration of our obligation to the (vulnerable) other, whether they be a fellow human person or a part of our broader, integral ecosystem.

The questions that XTx pose implicate com-

plex ethical frameworks and a sprawling health infrastructure. Research ethics questions — such as, “How are we to fairly and equitably select research participants for XTx clinical trials?” — arise first in the context of XTx. And, if XTx advances to clinical practice, there will be a need to develop a new framework for allocating organs and bridge therapies.

There are also broader questions in need of consideration, including “Can we justify the potential for the mass farming of pigs for their organs?” and “Should prohibitions on the buying and selling of human organs expand to the buying and selling of organs more generally?”

A CALL TO CARE FOR THE GOOD OF ALL

XTx offers promising technology that requires rich and sustained ethical reflection. What we owe nonhuman animals forms a part of this reflection, but perhaps the more difficult question posed by XTx is what we owe our neighbor. XTx, especially with its corresponding potential to open a (pig) organ market, poses the possibility of both ameliorating and exacerbating existing inequalities, disparities and injustices, as well as creating others.

The Catholic tradition has much to say about these matters, and continued ethical reflection on XTx from within such a tradition can meaningfully shape our understanding of XTx and work toward the integral good of all.

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NOTES

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