

# 16. Researching Xenotransplantation

## Moral Rights of Animals

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### 1. Introduction

“Ein Herz für uns” (“A heart for us”): this is the title of a recent article on xenotransplantation in *Die Zeit*, one of Germany’s major newspapers (Steeger 2019). The article describes experimental research taking place in Munich, Germany, in which researchers have cloned and genetically modified pigs. Their aim is that humans, such as the several hundred people currently waiting for a donor heart in Germany, will soon be able to receive the animals’ organs. As far back as 1999, a famous Swiss company predicted it would be able to provide 300.000 animal organs for human use by 2010. In 2006, US scientists also expected that the first clinical trials would take place by 2010. At the time of writing it is 2020, and none of these developments have eventuated.

While some people want pigs to have hearts for humans, others feel that we humans should, in a sense, have a heart for pigs and not use them in this way. Is it ethically acceptable to use pigs as resources for spare body parts, and to use non-human primates and other animals as experimental subjects in order to develop the technology? This chapter addresses these and other questions about the ethics of xenotransplantation.

### 2. Xenotransplantation Research

Deriving from the Greek word *Xénos* ('foreign'), 'Xenotransplantation' refers to the transplantation of *living* organs, tissue, or cells across species boundaries. Tissue transplants from *inactivated* cells, such as the transplantation of heart valves from pigs to humans, do *not* count as xenotransplantation. The same holds for animal-based products that contain only molecules, such as insulin derived from pigs. In case of xenotransplantation of living *organs*, the incoming heart, liver or kidney is connected to the recipient’s body and is supposed to perform all normal functions. In case of xenotransplantation of living *tissue*, such as skin, corneas or bones, the recipient’s blood vessels are supposed to nourish that tissue, a process called ‘vascularization’. Xenotransplantations are ‘concordant’ when the two involved species have a close phylogenetic, i.e. evolutionary, relationship, such as in ape-to-human transplantation;

otherwise they are 'discordant', as in pig-to-human transplantation (Cooper/Wagner 2012). 'Xenotransplantation' is typically contrasted to 'allotransplantation' (transplantation within a species) as well as to autotransplantation (transplantation within an individual).

Since the end of the 1990s, xenotransplantation research has flourished, mainly in the United States and the United Kingdom, but also in Germany. Accounts of the history of xenotransplantation research typically mention the so-called Baby Fae case, which spurred public debate about the technology and also led to some regulation. In 1984, the surgeon Leonard Bailey replaced the heart of the newborn human, Stephanie Fae Beauclair from Los Angeles, who was born with a severe heart problem, with the heart of a baboon. The baby died 20 days later. The research involving Baby Fae was severely criticized, not least because a surgical procedure that could have cured the baby's heart condition already existed. Moreover, the xenotransplantation couldn't possibly have succeeded, and it was considered foolish to believe it could (Gericke 2014). Dr. Bailey had previously performed at least 160 transplantations between different species, such as sheep, goat and baboon, all of which resulted in the death of both donor and recipient. This was also the outcome of the hundreds of trials by other xenotransplantation researchers undertaken since the early 20th century. For example, Keeth Reemtsman performed 13 chimpanzee-to-human kidney transplantations in 1963–1964, and Thomas Starzl carried out many liver transplants between chimpanzees and human children. Nearly always, the xenotransplantation failed due to hyperacute organ rejection (Gianello 2014). Transplantation medicine in general was in an experimental stage during the 20<sup>th</sup> century. For example, it was only in 1954 that Joseph Murray first successfully transplanted a kidney between two identical twins.

Nowadays pigs are considered the most likely non-human organ sources for humans. Speaking of 'donor' animals in case of xenotransplantation would be a euphemism, since the animals do not voluntarily *give* their organs. (More appropriate labels might be 'organ sources' or 'transplant victims'.) Pigs are considered suitable due to the size and function of their organs, which are similar to those of humans. Furthermore, the risk of transmitting viruses is smaller for pigs than for species that are more closely related to humans, such as primates. Finally, pigs are relatively cheap and easy to breed. A disadvantage of using pigs, however, is that the human immune system tends to reject pig organs even more rapidly than those of more closely related species (*ibid.*). Pigs are not only envisioned as a source of solid organs for humans: porcine pancreas and brain cells are being tested for use in the treatment of diabetes and Parkinson's disease, respectively. In the latter case, the brain cells are coated in seaweed, preventing the human immune system from attacking the xenograft while allowing growth factor to move into surrounding brain tissue. Furthermore, pig livers have been used *ex vivo* – i.e. connected to the human body externally – as a temporary support for humans with acute liver failure.

To date, porcine organs have mainly been transplanted into non-human primates as part of efforts to develop the technology. No xenograft recipient, regardless of species, has ever survived for longer than a few months; typically, they die much earlier. It is technically still unclear whether pig hearts, or other living body parts from any non-human species, could ever be modified to function in humans. The major technical problems in xenotransplantation research are (1) the required correspondence of size, structure and function between organs; (2) the hyper-acute rejection of the

newly received organ by the recipient's immune system (as well as a rejection on the medium and longer term in cases where hyper-acute rejection was prevented); and (3), the risk of transmitting infectious diseases from non-human animals to humans. Because humans received the HIV and the Ebola viruses, as well as influenza viruses and most recently the Coronavirus, from non-human animals, it is feared that other deadly viruses may cross the species boundary as well. Furthermore, the non-human transplant victims are genetically modified to resemble humans in certain respects, and the human recipients receive drugs to suppress their immune response, potentially paving the way for so-called xenozoonoses: infectious diseases from other species. This concern informs various international laws and regulations regarding xenotransplantation, which range from mandating protective measures for the clinical use of xenotransplantation to temporary bans on its clinical use (Schicktanz 2018). Given these major obstacles, xenotransplantation research is still in an experimental stage.

Nevertheless, some researchers expect new technological developments to bring clinical trials closer. In 2017, US scientists succeeded in removing porcine retroviruses from the genome of pigs by using CRISPR and CAS9 technologies (Niu et al. 2017). Porcine retroviruses are considered particularly dangerous because they have been shown to infect human cells *in vitro*. If they found their way into humans via transplants, they could not only infect the organ recipients but also spread to other people, and in the worst-case scenario they could cause dangerous new pandemics. Therefore, removing the retroviruses counts as an important achievement. Furthermore, researchers are now able to knock out the pigs' growth hormones, thus allowing them to farm smaller pigs with more human-sized hearts. Furthermore, these pigs are genetically modified to produce a human protein, and to lack a porcine enzyme. Such modifications are meant to prevent the human immune system from destroying the transplanted organ. In addition, the genetically modified pigs in Munich now produce a further protein, which prevents blood clotting in the transplant. These new technological possibilities make clinical trials more likely to happen and have sparked renewed interest in the relevant ethical issues (Wünsch et al. 2014, Mohiuddin et al. 2016, Kemter et al. 2017).

### 3. Ethics

The ethics of xenotransplantation have been discussed in politics, society and academia for more than a decade (Bartholomew/Auchincloss 1998; Quante/Vieth 2001; Schicktanz 2002; McLean/Williamson 2005). The question at the center of this discussion is whether xenotransplantation research should continue. Some of the arguments put forward in this debate are narrowly anthropocentric (i.e. human-centered), holding that humans should be the sole objects of our moral concern. Accordingly, such arguments typically address the harms and benefits of the technology for humans. In contrast, other arguments are premised on a wider, sentientist perspective, according to which all sentient individuals deserve our moral consideration, and therefore it also matters how the technology affects sentient *non-humans*.

### 3.1 Harms and Benefits for Humans

Moral theories seek to determine what is morally right or wrong and why this is so. These theories can be divided into consequentialist and non-consequentialist, or ‘teleological’ and ‘deontological’, theories. The former evaluate actions *only* on the basis of their consequences, whereas the latter do not, or at least do not *only*, consider consequences. Arguments that evaluate the significance of xenotransplantation for humans typically focus on consequences of the technology. This is not to say that only consequentialists can or do embrace these arguments; even those who hold that other considerations are ethically relevant *in principle* may concede that the potential harms and benefits of this technology should play a major role in its evaluation.

If we are to assess the harms and benefits of xenotransplantation research for humans, we must compare it with alternatives. After all, ‘harm’ and ‘benefit’ are comparative notions. By definition, an event benefits me if and only if it leads me to be better off than I would otherwise have been; conversely, an event harms me if and only if it leads me to be worse off than I would otherwise have been. This is the standard, counterfactual account of harm and benefit.

In debates about xenotransplantation it is typically assumed that transplant recipients, and less directly their friends and families, would benefit from the technology. But whether the recipients can be said to benefit depends on how receiving the transplant compares with the counterfactual scenario. If the transplant granted them additional years of life when they would have otherwise died, the transplant benefited them. How great a benefit this was would depend on the quality of the transplants. It also would depend on other factors. For example, transplant recipients might be forced to live with unusual restrictions on their privacy due to being subjected to measures designed to prevent the spread of infectious diseases. They might even have to register their interactions with other people. The restrictiveness of these measures would depend on the remaining risk of zoonoses. The overall benefit to the transplant recipients would also depend on how many people received xenografts. Finally, the extent of the benefit (or harm) would depend on the exact nature of the counterfactual situation. Would people that received a xenograft have otherwise received an allograft? Or would they have died? Since we currently do not know these facts, it is unclear and controversial what the benefits of xenotransplantation would be. (This suggests topics for further empirical research, but also for ethical exploration. For example, there isn’t much debate in ethics yet about how pig organs should be allocated after the phase of clinical tests.)

One might also wonder to what extent certain pharmaceutical companies or scientists would benefit from advancing xenotransplantation. It is easy to imagine that companies could profit greatly, not least from selling immunosuppressive drugs. And scientists might have a range of motivations for becoming involved in xenotransplantation research. However, these potential benefits do not do much to justify the technology. If the technology could not be independently justified, the fact that some people earned fame or money through it would not make it any more acceptable. On the contrary, it would cast a negative light on those who profited from it.

Promotion campaigns for organ transplantation commonly depict stories of patients whose lives have been prolonged by the technology. These benefits are undeniably relevant. However, such campaigns do not show what benefits might have accrued

from spending the same amount of money differently. For example, many diseases could be prevented or cured much more cost-effectively. That is, spending money on transplantation technology has so-called opportunity costs. This gives some indication of the harm caused by the technology: based on the counterfactual account of benefit and harm, the technology is harmful insofar as it consumes resources that could otherwise have provided more benefit to individuals. In times of scarce resources and pressing unmet needs, these opportunity costs are morally significant.

There are other potential harms to consider if xenotransplantations were actually performed on human patients. As already mentioned, viruses could infect transplant recipients and cause new pandemics, although new technological developments are supposed to reduce the likelihood of this scenario. This raises the general question of how to account for risks that have a very low probability but very high stakes. How cautious can we and should we be, and when, if ever, is it acceptable to take such a risk? Should we act according to the precautionary principle, or according to some other principle? A relevant example is how to reduce the risks of zoonoses. For example, it has been argued that trials with humans are unavoidable in the development of xenotransplantation, but that allowing test subjects to interact with other people would be too risky. Therefore, it has been suggested that the bodies of people in a permanent vegetative state could be used for this kind of research, assuming the prior consent of these body-donors (Ravelingen et al. 2004). Others have argued that various safety measures are required before such risks could be taken (Rothblatt 2004). In any case, in medical ethics, the principle of patient autonomy is central, therefore it can be expected that there will be no trials on human subjects without their prior consent. Furthermore, clinical trials are typically performed only on patients who have a real chance of benefiting from the experimental treatment. They receive the experimental treatment in cases in which no other treatment is available that is at least as good as the experimental treatment. This latter condition would not be fulfilled if one used the bodies of body-donors. But arguably this can be justified, given that they consented and that (arguably) no harm can be done to them anymore.

Some authors also conceive of risks related to blurring the boundaries, as it were, between humans and non-humans. The species concept is controversial, as is talk of 'boundaries' in this context. Nevertheless, some authors fear negative effects on the self-conception of organ recipients, and they are also concerned about uncertainty regarding the moral status of the resulting animal-human chimeras, such as the genetically modified pigs that produce human proteins or the humans with porcine organs. The status of these beings is of concern in human-centric approaches, but less so from a sentientist perspective. After all, this perspective holds that sentience, not species membership, determines an individual's moral status.

### 3.2 Harms and Benefits for Non-Humans

According to the sentientist position, the boundaries of the moral community – those individuals who deserve moral consideration – do not follow species boundaries. Instead, all and only sentient individuals can have interests, such as the interest in not suffering. In other words, all and only sentient beings are subjects of wellbeing. Animal ethicists have argued that discounting the interests (that is the wellbeing) of non-humans just because they belong to another species than we do, is speciesist. Spe-

ciesism, according to these authors, is a form of wrongful discrimination, akin to sexism and racism. This is not to say that it is never justified to sacrifice some individuals for the greater good. Whether or not this is ever justified is a perennial debate in ethics. But the fact that we would not be willing to cause the same amount of harm to humans as we do to non-humans has been criticized as being incompatible with the principle of equal consideration of interests (Singer 1975).

In the course of xenotransplantation research, large numbers of non-human animals are harmed due to the way in which they are housed and treated. These animals suffer from inadequate housing conditions that induce behavioral abnormalities, anxiety, stress and pain. Furthermore, these animals are ultimately deprived of living full lives, for example when they die due to housing conditions or are killed during experiments. Most must live their brief lives in a laboratory, subjected to invasive and deadly research. For example, experiments undertaken at the University of Munich, Germany, include the following:

1. The hearts of six genetically modified pigs were transplanted into baboons. The baboons received immunosuppressive drugs. A special camera observed the blood vessels in the mucous membrane under their tongue. All the monkeys died between five hours and four days due to organ rejection or heart failure.
2. Two baboons received the hearts of two non-transgene pigs in addition to their own hearts, resulting in a hyper-acute rejection of the new organs. The transplanted hearts swelled up and the animals were killed.
3. In order to study damage caused to transplanted organs, the arms and legs of 19 unconscious monkeys were bound. All blood was removed from their arms and legs and replaced with human blood. The blood vessels in their muscles were observed under microscope. Finally, the monkeys were killed.
4. The hearts of four genetically modified pigs were transplanted into the bellies of baboons. The baboons received immunosuppressive drugs. The transplanted organs swelled to twice their original size and were rejected within two to eight days. The report does not specify whether the monkeys died or were killed (Gericke 2014).

No official numbers exist, but it is estimated that more than a thousand primates have been used for xenotransplantation research of this kind over the past 20 years, particularly in Europe, North America, and Russia (Schicktanz 2018).

Does it make a moral difference whether pigs or primates are used as organ sources? We already saw that there are practical reasons for using pigs. But from an ethical perspective one can ask whether using pigs rather than primates can be justified, and if so, how. If one only considers human interests, the mere fact that humans prefer pigs as organ sources would favor this choice. After all, if only human interests are considered, and if those are better served by using pigs, then this is considered the better option. However, from a sentientist perspective the issue is more complicated. If being used as an organ source harmed non-human primates more than pigs, this could justify the use of pigs according to a sentientist view. It may well be the case that the conditions of breeding, confinement, handling and so on are more harmful for primates than they are for pigs, in the sense that more of the primate's needs would be frustrated under such circumstances. If this were the case, it would count in favor

of using pigs above primates. (One could argue that primates would be treated better than pigs, because breeding primates would be more expensive. But I think in both cases ensuring a sufficient quality of the organ is not the same as ensuring a good quality of life for the animal in question.)

Some authors have argued that apes and perhaps also monkeys have a higher moral status than pigs and should therefore not be used. This position is incompatible with sentientism, which grants all sentient animals an *equal moral status*. Here, it is important to distinguish between two claims: that harm to primates matters more than harm to pigs, even if it is the same amount of harm; and that harm to both matters equally, but, due to different interests, an intervention may be more harmful to one species than it is to another. Only the latter consideration is compatible with the principle of equal consideration of interests.

It has been argued that death is more harmful for individuals that have plans for the future. According to such a position, death may be a greater harm for primates, assuming that primates tend to have more plans than pigs (Singer 2011). According to an alternative and more prominent view, though, the harm caused by death is not the frustration of desires but the deprivation of value, i.e. the amount of future welfare that it takes away from the individual (Bradley 2009). According to this view, if the individual would otherwise have had a pleasant future, death is harmful regardless of whether the individual had any plans or desires. Given that a chimpanzee's natural lifespan is about twice that of a pig, if both animals were killed at the same age, the chimp would probably lose more than the pig because he would have otherwise lived longer. According to this deprivation view, even individuals that live entirely in the present – such as human babies, small children, certain mentally disabled humans, and certain non-humans – can be harmed by death. Thus, whether death is a lesser harm for pigs than for primates depends on empirical facts about their capacities, the relevant counterfactuals, and the correct theory about the harm of death.

#### 4. Moral Rights

When evaluating actions, many ethicists consider not only harms and benefits for individuals but also their moral rights. In general, moral rights function as constraints on what can rightfully be done to someone. For example, people often appeal to the moral right to life in order to argue that it would be wrong to kill a person, even if this allowed us to use her organs to save three lives. Moral rights are often seen as protections of the individual's basic interests. This includes sentient non-human animals, which also have interests. For example, all sentient beings have the interest not to be in pain. We already saw that it would be discriminatory to neglect or discount this interest just because the being in question belongs to a different species. So, non-human animals are considered subjects of rights, and these rights form constraints as to what can justifiably be done to them. The notion of 'animal rights' refers to the rights of sentient non-humans.

Of course, it is not necessarily a rights violation if one suffers due to someone else's actions. But authors who accept moral rights would argue that if someone kicked me in the face simply to hurt me, or killed me in order to harvest my organs, they would be violating my right to bodily integrity. There is no principled reason why sentient

non-humans should not have similar rights. And if they have such rights, xenotransplantation and related research is at least *prima facie* wrong.

In special circumstances, one may have to choose between two unavoidable rights violations. If we had to choose between the death of a pig (for xenotransplantation purposes) and the death of a human (due to organ failure), wouldn't the death of the pig be the lesser evil? If both had a right to life, what would be the right thing to do? Those who appeal to moral rights broadly agree that xenotransplantation is not an example of a so-called lifeboat case. In lifeboat cases, one individual must be thrown overboard to save the other passengers because the boat is too full to carry them all – the question is who this unlucky person should be. But in the case of xenotransplantation, the pig is not in any danger *until we put it there*. Thus, rights views typically hold that xenotransplantation is unacceptable. A right to life, after all, does not entail that others have the duty to save one's life under all circumstances. Rather, it normally entails protection from being killed (Pluhar 1995).

Rights views assume that there is a morally relevant distinction between doing and allowing harm. For example, killing is usually considered a rights violation, including killing another person in order to harvest her organs to save three others. Letting someone die is usually not a rights violation, as in the case of letting a patient die on the waiting list for a transplant. This raises the question of why there should be a right not to be killed but not a right to be saved. One possible explanation is that rights are justified claims on others, and in order for such a claim to be justified, it shouldn't demand too much. It is generally much less demanding for others to refrain from killing than it is for them to save lives. In general, if I require from others that they do not kill me, I leave them free to choose what else to do. If, instead, I require from them to save my life, this may leave them with only one option. According to this view, there is a moral duty to save a life only in exceptional cases in which doing so would not be overly demanding.

Those who accept rights views need to specify the exact rights possessed by a rights-holder. Here, knowledge of the basis of moral rights is helpful. Some authors base rights on interests, i.e. on wellbeing. If rights should protect wellbeing, this already suggests what rights an individual should have: for example, a right to life and to bodily integrity. Other authors ground rights on some form of inherent value. In that view, rights are meant to safeguard an individual's autonomy or even dignity. It has been argued that regarding sentient beings as mere means (or close to mere means) is morally wrong. Along these lines, one can ask whether animal research in general, and genetic modification of animals in particular, entails regarding these animals as mere means (Parfit 2012: 212–233).

It has been argued that for those who accept moral rights, accepting rights for all sentient animals should be a matter of consistency. After all, what could possibly justify accepting moral rights for all humans but not for any non-human? For all plausible grounds for moral rights, it holds that either not *all* humans qualify for rights or that *some* non-humans qualify as well. For example, if only moral agents (i.e. those who can act on the basis of moral principles) possessed moral rights, non-human animals would be excluded, but so too would be human babies, severely mentally disabled humans, and Alzheimer's patients. Thus, those who want to grant special protection to humans but not to non-humans have to face the so-called argument from marginal cases: the relevant capacities are not divided neatly along species boundaries. It is hard

to justify that individuals should be treated based on characteristics that are common for members of their group (for example their species) but which they themselves do not possess (Norcross 2004).

Rights views, i.e. moral theories that appeal to moral rights, are typically non-consequentialist. For example, Tom Regan argues that sentient animals (above one year of age) are rights holders because they have a good of their own (Regan 2004). In a similar but more elaborated way, Christine Korsgaard (2016) defends animal rights on what she takes to be a Kantian basis. Those authors, just like others who argue that animals have moral rights, are also passionate defenders of *legal* rights for animals, such as the right not to be killed or injured. Garry Francione (2000) grounds his animal rights theory on the claim that animals have the right not to be property. Those who hold that rights should protect interests are not convinced by Francione's arguments, since they hold that animals do not have an interest in not being property, although they do have an interest in freedom from pain and in continued life. This is because these things promote the animal's welfare, but whether or not an animal is someone's legal property can only *indirectly* influence the animal's wellbeing. Changing its property status is something that could have positive effects on animal welfare, but it is not something that matters to the animals themselves (Cochrane 2012).

A *consequentialist* defender of moral rights, Chris Woodard (2019), recently argued that consequentialists should care not only about determining individual acts that have the best consequences but also about practices that are beneficial if enough people participate in them, such as respecting animal rights. This claim is based on the plausible empirical assumption that respecting animal rights *generally* has positive consequences, even if it may not have the best consequences in every individual case. According to this view, an animal's moral right to life is itself enough reason for someone to refrain from participating in an action that would lead to an animal's death.

Rule consequentialism, a sub-variety of consequentialism, may not accept the *a priori* existence of moral rights, but it may accept rules that forbid killing innocent individuals, or similar. According to rule consequentialism, an action is right just in case it conforms to the set of rules that, if endorsed by (nearly) everyone, would have the best consequences (Hooker 2002). Such a set of rules could conceivably contain the rule not to perform invasive experiments on non-consenting sentient beings, or the rule not to kill.

Most consequentialists do not accept *moral* rights, but they typically favor *legal* rights for sentient beings. If accepting legal rights has better long-term consequences than not doing so, consequentialism requires that we respect those rights. Thus, it might lead to better overall consequences in the long run not to assess animal experiments on a case-by-case basis but to forbid them across the board in the name of animal rights. Similarly, when classical utilitarians argued against discrimination against women and against slavery, they favored fundamental legal reforms. They did not argue that one should assess on a case-by-case basis whether some instance of slavery did more good than harm. Along these lines, even classical act-consequentialists could argue in favor of legal rights for animals.

Sue Donaldson and Will Kymlicka's (2011) book *Zoopolis* strongly influenced the recent discussion of animal rights in the field of Political Theory. Donaldson and Kymlicka accept that animals have moral rights and, based on this, they spell out which legal rights animals should have. The authors divide sentient animals into three politi-

ical categories: citizens, denizens, and sovereigns. Legal rights and duties, they argue, should be accorded on this basis, as they are among humans, who all have the same fundamental human rights but also have more specific rights based on membership in one of the three political categories. Thus, just like former slaves, domesticated animals should be accorded citizen status, a move which would be incompatible with using them as a source of organs. A common objection to this argument is that pigs cannot be citizens because it makes no sense to give them the right to vote in elections. However, certain mentally disabled humans count as citizens even though they do not have the right or capacity to vote in elections.

One might object that, given that we routinely kill many pigs and other animals for food, xenotransplantation research cannot be wrong. Nearly no one needs meat, dairy or eggs to survive, or even to stay healthy, yet we routinely harm and kill large numbers of animals for these products. How could it then be wrong to harm and kill a relatively small number of non-humans in order to save human lives? But the mere fact that we harm and kill countless animals for food does not mean that it is morally justified. A sentientist position asks us to reconsider both novel and more traditional forms of animal use.

## 5. Conclusion

New technological developments are spurring renewed interest in the ethics of xenotransplantation. But is continued research into xenotransplantation justified? The ethical debate about xenotransplantation features two main lines of argumentation: anthropocentric and sentientist. The former focuses on harms and benefits for humans. The main benefits of continued xenotransplantation research are the potential improvements to the welfare of organ recipients and their loved ones. The extent of this benefit is still unclear, since it depends on the quality of the organs and on the required public safety measures, among other things. The main costs are the opportunity costs: the lost benefits that would have occurred if scarce health care resources had been invested in other, more cost-effective, projects. Other costs include the various risks of the technology for humans, most importantly the risk of zoonoses. By contrast, sentientist arguments consider the interests of all sentient beings on an equal basis. These arguments allow for animal rights, which are meant to protect animal interests and function as constraints against killing and injuring animals for research purposes or as organ sources.

Is xenotransplantation acceptable from a sentientist position? From a sentientist position that grants moral rights to non-human animals, xenotransplantation is clearly unacceptable. A sentientist position that is not based on moral rights would still be likely to accord legal rights to animals, which would also be incompatible with xenotransplantation. At the very least, according to a sentientist position, the welfare of non-human sentient beings would be taken as seriously as that of humans. Whether such a non-speciesist principle of equal consideration would be compatible with xenotransplantation depends on what the consequences of all available options would be for the wellbeing of all concerned individuals.

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