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Casuistry and the moral continuum: Evaluating animal biotechnology

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Abstract
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Casuistry and the moral continuum
Evaluating animal biotechnology

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Abstract. While the science of animal biotechnology is advancing at a rapid pace, the ethical discussion about the boundaries the public might want to set is at the most nascent stage. There is a tendency in the public debate for opponents to favor an all-out ban on the science, while proponents want to grant it *carte blanche*. I argue that a more nuanced position on animal biotechnology considers individual projects to be located on a moral continuum, where some are clearly morally justified, others morally impermissible, and some lie in the ethical gray-zone. To begin to define this continuum, we use the bioethical method of casuistry to analyze one case at the end of moral permissibility, and we contrast it with a case that is located at the opposite end of the moral spectrum. I advocate this approach to assessing the moral merit of biotechnology projects because of its attention to the details of individual cases — the protocols, ends, and methods — on which an accurate moral judgment necessarily rests.

The science of animal biotechnology is progressing very rapidly, as seen in projects ranging from pet cloning to biopharming to xenotransplantation to the preservation of endangered species. While the science of animal biotechnology advances undeterred, the ethical discussion about the boundaries the public might want to set is at the most nascent stage. While some favor a blanket prohibition of animal biotechnology that is unlikely to be imposed on the biotechnology industry, most others view this science as having a continuum of moral permissibility, with some projects seemingly justified and others not. But which of the animal cloning and transgenic projects are ethically permissible, and which ones cross an important moral line?

To make these critical ethical decisions, we need a moral framework for conducting an analysis of particular animal biotechnology projects. If we are to escape the trap of rejecting or embracing all animal biotechnology, we need an approach that focuses on the individual protocols, ends, and methods of specific projects. This emphasis on the particular is necessary for a field like animal biotechnology where projects are pursued for a myriad of reasons, involving varying degrees of animal suffering, alteration, or modification. With its history of case-sensitivity, I advocate the use of bioethical casuistry as the most useful method of moral evaluation.

To demonstrate this method of assessing the merits of biotechnology research, I examine two contrasting projects with human-medical implications: the "biopharming" of transgenic goats in order to harvest proteins in the animals' milk; and the creation of genetically modified pigs for the long-term goal of xenotransplantation.

On this casuistical approach, I use the first project as a paradigm case of moral permissibility; I then use the moral insights gleaned from this case to reflect on other current animal-biotechnology projects, focusing specifically on the case of genetically modified pigs. The goal is the description of a moral continuum along which other projects in the animal biotechnology can be located.

Casuistical analysis of animal biotechnology

First used in the Middle Ages, casuistry was considered a viable approach to moral judgment until the seventeenth century, when it fell out of favor. It has recently been revived in contemporary bioethics because of its reliance on paradigm cases — a strategy akin to the use of legal precedent — which functions well in a field that often advances its thinking based on reflections about particular clinical- or research-ethics cases. Casuistry, then, is a bioethical approach to ethical analysis in which moral permissibility is determined by analyzing a particular case, mining that case for the ethical considerations relevant to it, and producing moral principles or "rules of thumb" that capture the insights and intuitions discovered there. This method was first articulated for bioethics by theorists Albert Jonsen and Stephen Toulmin in their book *The Abuse of Casuistry: A History of Moral Reasoning*. Since the use of casuistry is comparatively new in bioethics, debate about which of its versions is most defensible is still on-going; here I follow the interpretation articulated by John Arras.[2] The distinguishing feature of Arras's casuistry is that "ethical principles are 'discovered' in the cases themselves, just as common law legal principles are developed in and through judicial decisions on particular legal cases."[3] Arras considers his version of casuistry to be faithful to the theory articulated by Jonsen and Toulmin, not an alternative to it. I agree that two different strains of casuistry can be found in their work, with two different views of the role and status of moral principles. In the first strain, principles are simply applied to a new case; in the second, principles are actually generated in the cases themselves. Both strains are evident in the work of Jonsen and Toulmin, and I believe that each strategy has an important function in the field of bioethics. For novel problems with very little precedent, the strategy of using the cases to generate guiding principles is most helpful; in areas of bioethics that can be analogized to other well-trod ground, bringing widely accepted principles to bear is more helpful.

In my analysis, then, rather than coming to a case with a set of relevant principles already in hand and then applying them, I first reflect on the case and then generate principles that articulate the moral considerations found there. These new "principles" can then be used to reflect on other, similar cases. This method makes room for novel ethical solutions to moral problems because it does not demand that we secure agreement on the set of principles that ought to govern in the specific case before we begin. What casuistry seeks instead is agreement on what is morally relevant in the case — that is, agreement on our moral reactions to the case. Arras writes, "Progress . . . [is] achieved, not by applying agreed-upon principles, but rather by seeking agreement on responses to particular cases."[4]

This method is especially suited to the animal biotechnology, where the uncharted moral terrain of cloning and transgenesis has no widely accepted moral principles that can be effectively and helpfully applied. We have no clearly articulated principles to guide us in our reflections on this new area of science, short of the cluster of principles that guide any animal experimentation, such as the principle of using appropriate sedation or anesthesia.[5] But it is not enough to navigate this new technology to know *how* to treat the new clones or transgenic animals once we have created them or during the process of creation; we need to know *whether* we ought to create them in the first place. Therefore, current animal regulations will not offer much insight. We need new guiding principles, and casuistry may enable us to generate them. Here I argue for the acceptance of a *particular* project as the paradigm case of moral permissibility for animal biotechnology generally. I claim that the moral considerations generated in that paradigm case can be codified into two principles usable elsewhere along the animal-biotechnology continuum.

One important note: the cases to be used here are, technically speaking, "hypothetical" ones. Since the details of current projects can change so rapidly (and since the lay person has access to research facts only once research is completed, or well underway), I present *types* of projects, though scientifically viable ones that either have been or are being conducted, staying faithful to their methods but not claiming to report particular work done in any particular laboratory. Again, I am trying to describe a moral continuum secured by principles applicable to actual animal-biotechnology projects pursued around the globe. I am not commenting on specific scientists or projects.

Case 1

I start with a transgenic project involving the modification of goats for the purpose of biopharming.

Take the following case: transgenic goats are produced that secrete into their milk a human protein that will be harvested to treat a disease, which has no other effective treatment; a human gene is introduced into an early goat embryo, which is then implanted into a surrogate; only a handful of goats are produced this way; once the founder herd is produced, the goats are naturally bred and the offspring will express this same protein in their milk; the protein is harvested by normal means of milking; no additional restrictions are placed on the herd due to its biopharming function: they are kept in pastures, in groups; the transgenic goats are confined so that they do not breed with other goats used in agriculture; and, no detectable differences exist between the health status of the genetically modified (GM) goats and non-GM goats.

This claim about the health status of GM goats reflects what appears to be the case in current transgenic science. It is too early to determine whether the long-term health of these animals will mirror naturally bred animals. But if transgenic goats suffer decreased lifespan or as-yet-undetected congenital abnormalities, comparison cases — pigs bred for xenotransplantation — will suffer in similar ways. However, depending on the severity of the problem and the suffering that accompanies it, this compromised health status may indeed alter our assessment of moral permissibility — in all cases.

A casuistical analysis of this case starts by highlighting moral considerations or features that we find their, *i.e.*, what matters ethically. First, genetic modification *per se* does not cause pain or suffering in the animal. Second, the animal's "species-life" — the animal's preferences, conditions under which the animal thrives, etc. — is protected, despite biopharming. Assuming that "quality of life" for a goat — what we are calling "species-life" — means being able to roam free, uncaged, without being separated from other members of that species, then these transgenic goats in the project we describe have a quality of life no different from domestic goats raised for agricultural purposes on farms that pay close attention to animal welfare issues, *i.e.*, that adhere to the highest standards of animal husbandry. The preferences and conditions under which the goat species thrives are not undercut in this type of transgenic modification. Because the intended product of transgenic goats is the milk, which is the same product in conventional, non-GM farming of goats, there need be no extra restrictions placed on the lives of these goats, so the herd need not be treated differently from non-GM goats. It is only after the milk is procured that the special process of harvesting the protein in the milk is begun. Additionally, because this milk is not going to be consumed as milk (it is only the protein that will be used, and only after extensive clinical trials that test for safety and efficacy), and the goats will not be used for meat, there are no concerns here about potential risks to human beings in consuming such GM products. Similarly, since the confinement of these GM goats is easy to achieve, the breeding with non-GM goats (a potential environmental hazard) is easy to avoid.

If the features of the case discussed above really *are* all morally salient (that is, really do matter to us morally and are therefore worth our moral consideration), then we may "try out" two different moral principles that attempt to capture them. I use the language of "trying out" a principle — something like an ethical audition — because in casuistical theory new moral principles are not immutable but serve as guidelines that, as Arras puts it, "are always subject to further revision and articulation in light of new cases."[6] The goal in casuistry is to find principles that do effective moral work in the real situations we find ourselves in; casuistry is not an esoteric exercise in establishing irrefutable commandments that we may or may not be able to apply to the concrete problems we face.

To this end of finding pragmatic principles that may help us navigate the landscape of animal biotechnology, we can employ the two traditional modes of moral reasoning used to assess moral permissibility: consequentialist reasoning that determines permissibility based on costs and benefits; and nonconsequentialist reasoning that determines permissibility based on moral rules. If we start with consequentialist reasoning and take into account all of the salient features of a case, then we find enormous potential benefits to the human recipients of safe and effective pharmaceuticals efficiently produced; little, if any, sacrifice by the animals used in the process; and no risks to the environment. In an ethical cost-benefit analysis, this project appears to have all gain and no cost. (Again, this conclusion would change if animals were found to suffer greatly from genetic modification. So far they have not seemed to.) On purely consequentialist or utilitarian terms, the moral evaluation of this project is overwhelmingly positive.

But what did casuistry do for this analysis that garden-variety consequentialism would not have been able to accomplish? In other words, what is new about this old mode of ethical assessment? Certainly not the weighing of costs and benefits, nor utility maximization. What casuistry does for this mode of moral reasoning is to put into relief all of the features of the case that need to be incorporated into the equation without first needing to settle century-long debates about animal rights or animals' moral status. I do not mean here to dismiss the importance of these philosophical debates, but their seemingly interminable character makes waiting for resolution impractical, especially when we need to reach conclusions now about current scientific projects.[7]

If we now switch our mode of moral reasoning to a non-consequentialist one, we will need to look for a "rule of thumb" with which to codify our moral responses. One feature that mattered to us was that the goats' "species-life" had integrity — that the goats' preferences for social interaction, stimulation, and activity be respected to whatever degree we can comprehend those preferences. On the other hand, while the goats were clearly being used for human purposes, the fact that the goats were instrumental goods did not in itself seem morally problematic. Combining these two responses, we might try the following rule of thumb, or new casuistical principle: "Animals may be used for human benefit, if the species-life of the animal is also respected at the same time." In more formal philosophical language, we might say, "Animals may be treated as a 'means' to some human purpose if they are also treated as 'ends' in their own right." This principle clearly has Kantian undertones, but Kant would not have liked it. Immanuel Kant was an eighteenth-century moral philosopher who carefully articulated what it meant for human beings to have moral standing. He was concerned about the treatment of animals, but his rationale was that we degrade ourselves by abusing animals. He did not think they were due any type of true moral regard the way human beings were. In fact, Kant would have protested that it was a version of what he called the second formulation of the Categorical Imperative, and, since this Categorical Imperative only applied to rational beings, he would have bristled at our "borrowing" it for this purpose. This is *not* a principle that Kant used to talk about our obligations to animals, and he would *not* have endorsed it for this purpose. In fact, he specifically wrote, "Act in such a way that you always treat *humanity*, whether in your own person or in the person of any other, never simply as a means, but always at the same time as an end."[8] But as we struggle to define the proper relationship between human beings and animals, and the proper treatment of animals, I believe this principle offers us a reasonable standard and safeguard that effectively captures our moral responses to the first case: using animals for our purposes is morally permissible as long as we respect them as sentient beings in their own right, ones that require species-specific conditions in order to thrive. In this redefinition of what it means to be an "end in itself," animals are entities whose suffering makes them worthy of moral consideration. Because they have a certain constellation of needs, preferences, and interests whose unfulfillment makes them suffer, we cannot simply use them in any way, under any and all circumstances, without regard for those needs, preferences, and interests. We *can* use them, but only under the condition that their own species-life is respected. Returning to our case, the transgenic project described above recognizes the particular species-interests of the GM goats and grants them the conditions under which they can be expected to thrive, while at the same time utilizing them for a noble and important human purpose. In the terms of our new casuistical principle, it treats them as an end, not purely as a means.

The advantage of our new rule is that it does exactly what casuistical theory says it should: it articulates a belief that most of us already intuitively hold. Of the casuistical method, Arras writes, "Rather than serving as a justification for certain practices, principles within the new casuistry often merely seem to *report* in summary fashion what we have already decided."[9] Let us think about this in light of our views on animals and animal rights. On the one hand, we submit that most people believe that the argument in favor of animal rights goes too far: after all, if animals have rights, then we cannot use them for food or clothing or in research unless doing so also serves the animals' purposes.[10] Nathan Nobis summarizes this perspective: if animals have rights, "then all industries and practices that exploit animals for their instrumental value ought to be abolished, and the individuals involved in this exploitation should be stopped. And this is true, regardless of the possible losses to the exploiters: they

have no right to ill-gotten gains ... Rights impose the duty that justice is done, as the saying goes, 'though the heavens fall.'"[11] Very few people hold this radical position on animals. On the other hand, the debate — framed typically *against* the plausibility of animal rights — often concludes that animals do not merit serious moral consideration.[12] But most people would reject that result as well. The middle-of-the-road position most of us hold steers us beyond this impasse and toward the view that animals can indeed be legitimately used but that our use of them should not result in the utter disregard of their species-life.

In review, I have argued that a casuistical approach to the first case shows that this instance of biopharming is morally permissible from either a consequentialist or nonconsequentialist perspective, using the principles we "discovered" in the case analysis. Thus, this case of biopharming serves as the paradigm case of moral permissibility that sets the standard against which other projects in animal-biotechnology can be measured. Having described a moral continuum along which various animal-biotechnology projects can be located according to their level of moral permissibility or impermissibility, I have argued that this type of transgenic project would be located at the far moral-permissibility end. In answering the question, "Which projects in animal biotechnology should we endorse?" I would begin with that point on the continuum and judge how far out we ought to travel. As a contrast point on the continuum — a point I believe to be located at the far other end — I will consider a project in the field of xenotransplantation. Again, I am not arguing that *all* xenotransplantation research will be located at the impermissible end of the moral continuum, just as I am certainly not arguing that all projects using transgenic goats will be located near the moral-permissibility end. Moral assessment lies in the factual details of *individual* cases.

Case 2

Take as a contrast case a project involving the genetic modification of pigs, which are designed to be "organ factories" for human beings. The background to this project is an international shortage of human organs for transplant and thousands of people dying every year on waiting lists. Given the circumstance that lies behind this project, it is clear that the scientific motivation is noble and pure: there is a profound human need and the use of GM animals may provide one possible solution. In this project, the pigs are genetically modified (by "knocking out" certain genes) to avoid two impediments to solid organ xenotransplantation: hyperacute rejection and acute vascular rejection.[13]

I begin this analysis by focusing on the particular conditions and restrictions imposed on pigs in one xenotransplantation project for the purpose of ensuring that they do not deliver to graft recipients either swine or human pathogens. To avoid passing along such pathogens, these pigs must first avoid exposure to them, and they must thus be born into and raised within a practically sterile environment. Clearing a bar this high requires drastic departures from the conditions in which pigs thrive. Pigs, it turns out, are highly social animals, extremely intelligent, with a curiosity that, unfulfilled, turns into self-destructive or aggressive behavior. They form social bonds and require social relationships. In this xenotransplantation project, the alteration of the pigs' environment begins at birth: the pigs are delivered from the sow inside the uterus via cesarean section and placed in a sterile incubator. They are not allowed to suckle; in fact, they have no contact with their mothers at all, and the mother is euthanized after the birth. In their sterile containers, there are no objects to satisfy the pigs' natural need for rooting or intellectual stimulation. They are kept confined, often alone. In summary, the species-life of the animal is completely disrupted by the research.

A second ethical concern raised by this type of project involves the human recipients, rather than the pigs, and may actually extend beyond the individuals who receive the xenografts, namely: the potential for transmission of a lethal, possibly contagious, disease that is undetected or non-pathological in the source pig. This is not an insignificant risk even in human-to-human transplants, as a recent case of rabies in four organ recipients shows.[14] In pig-to-human transplants, this threat may be much more serious since there may be pathogens we have yet to discover even in pig species. Two xenotransplantable pathogens have already been identified, one already endemic in human beings (the cytomegalovirus in the herpes family[15]) and one not found in the human species (the porcine endogenous retrovirus, or PERV[16]). While some scientists view these risks as small,[17] others are not so sanguine. Pioneer xenotransplant researcher Leonard Bailey, who in 1984

first transplanted a baboon heart into an infant, writes, "Fear of viral activation, recombination and/or mutation leading to some never before observed human illness . . . seems justified, and the issue requires further investigation."[18] On this ground alone, many bioethicists[19] and advocacy groups[20] argue against coming to rely on xenotransplantation to solve the organ-shortage problem.

With the foregoing in mind what can we now say about the moral permissibility of this xenotransplantation project? On a consequentialist, or utilitarian, calculus of the ethical cost versus ethical benefit, it might seem as if the need for organs outweighs all considerations of the animals being used, assuming that animal suffering matters, but that animals' moral status falls short of having rights. But the benefit-side of the equation is not so clean: significant biological hurdles must be overcome regarding rejection and infection. These two problems lead Bailey to conclude: "Together, the lack of efficacious host survival and concerns about the potential for novel, swine-induced host infection, have put a lock on clinical trials of pig-to-human solid organ xenotransplantation during the foreseeable future."[21] On balance, then, if we consider all of the issues that matter to us morally in this case, the cost to animals and the questionable benefits to human beings appear to make this use of animal biotechnology morally unjustifiable.

A nonconsequentialist analysis of xenotransplantation suggests no better prospect for justifiability. Using the principle that we ought to treat an animals as a means only if we also treat it as an end — that is, we ought never to treat an animal as a pure means — this project obviously will not pass ethical scrutiny. In the project described, xenotransplantation research shows no respect for the integrity of the animals being used and no consideration for the quality of life of the pigs.

In summary, then — and in contrast to the biopharming project, ethically an "all gain and no cost" proposition showing demonstrable respect for the species-life of transgenic goats — xenotransplantation projects using pigs appear to offer gain only if organs can actually be produced safely and transplanted effectively on a scale required to meet demand while presenting tremendous cost (certainly to the pigs and possibly to human beings) and demonstrating no respect for the species-life of the pigs. This judgment puts xenotransplantation research on the opposite end of the moral continuum from the transgenic goats project.

To this criticism of xenotransplantation, the proponents might offer the following rejoinder: what is the moral difference between using pigs for food and using them as organ donors? Surely, they would argue, using pigs to save human lives is much nobler than to using pigs to satisfy our base appetites, given all the nonanimal foods we could use to nourish our bodies. They would add to their case the argument that the pigs in this research are certainly treated better than the pigs subjected to factory farming, which is the most common type of farming in the industrialized West today. At least these pigs are disease-free and kept in hygienic conditions.

The response to these counterarguments is that proponents of xenotransplantation are using a false comparison: on the question of organs versus food, we cannot compare a morally impermissible method of farming with (as argued here) a morally impermissible method of medical research; we need to compare the case of humane farming with this type of medical research. Raising pigs by factory farming is not necessary; the quality of pork is not undermined by keeping pigs in their natural habitat under conditions that meet their natural needs; it might even be enhanced. The reason pigs are subjected to factory farming is to keep yield high and price low. But, again, eating as much pork as we do is not necessary to sustain human life; in fact, we would probably be healthier if we ate *less* meat, and the increase in price that would correspond to instituting better conditions for agricultural animals might thus serve us well. So to make a legitimate comparison between using pigs for organs and using pigs for food, we need to compare the best means possible to produce the organs and the best means possible to produce the pork. If restrictive conditions are necessary safely to produce organs for transplant, but natural conditions are possible to produce food, then the production of pork by humane farming methods appears to be morally permissible where the production of organs for transplantation does not. If pigs can be raised in less restrictive conditions for xenotransplantation, then the ethical analysis may look different. In the present case, based on the methods and protocols of xenotransplantation research as outlined, this solution to the scarcity-of-organs problem is morally suspect. Xenotransplantion

appears to be at the opposite end of the moral continuum from biopharming.

But need xenotransplantation research be conducted in this way? Perhaps not, and modifications to the research protocols may indeed change the locus of xenotransplantation projects on the moral continuum we have constructed. One Canadian research team, for example, took great care to construct what they call "high welfare" facilities for the pathogen-free pigs, which included keeping the piglets in groups, using heated beds and a simulated nursing apparatus, and providing rooting and exploratory activities and toys.[22] These provisions go a long way toward meeting the demands of our new nonconsequentialist principle that animals need to be treated as ends and not means only. And it also reduces the "cost" side of the consequentialist calculation for the other mode of moral reasoning we discussed here. This discussion brings into clear relief how furthering the same ultimate goals but doing so under different conditions could dramatically alter the moral assessment of a provocative project. The method demonstrated here not only shows how projects can be morally evaluated but also how scientists can improve the acceptance of their work by attending to moral considerations that matter intuitively to us all.

Conclusion

The construction of a continuum of moral permissibility for the area of animal biotechnology offers us a way to assess individual projects in transgenic science or animal cloning by taking into account all of the relevant moral considerations of a particular case. Against the backdrop of a science progressing faster than the public can react to it, it is easy to ask the question, "Have we gone too far?" But this is the wrong question because it assumes that we can judge entire categories of animal biotechnology (*e.g.*, transgenesis, pet cloning, gene transfer) rather than evaluating specific projects on their own merits. We have argued that moral permissibility or impermissibility is found within those details that get lost in blanket acceptance or rejection of this new science. A better question is, "Are we moving too quickly with animal biotechnology?" And the answer is undoubtedly "Yes." To safeguard both animal and human life, the animal biotech industry ought to pause for a project-by-project ethical analysis and review. We have argued that casuistical case comparison, parallel to the use of legal precedent, can help us locate projects on the moral continuum, enabling us to more effectively determine where the ethical lines ought to be drawn.

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