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Animal welfare and morality of the use of cloned animals

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Summary

Cloned animals are used in a wide range of species and in many contexts, such as agriculture, pharmaceutical production and animal research. Owing to their many benefits to humans, we can expect that the use of cloned animals will increase. Nevertheless, there is little focus on the ethical problems that are specific to the use of cloned animals among researchers and animal welfare bodies, as well as a lack of engagement with the general public on the subject. Most animal welfare problems that are specific for cloned animals may be ameliorated with improved husbandry methods. However, the discussion of the morality of using cloned animals will remain. This article gives examples of the ethical and welfare problems that are specific for the use of cloned animals compared to the use of conventional farm or research animals, and furthermore discusses the disconnect in the scientific community on their views on the use of cloned animals compared to the views in the general public.

Introduction

This paper is not intended to be an authoritative text on the different ideological perspectives of our uses of cloned animals for animal research, but to engender further discussion and debate on the topic. To begin with a confession, the author's professional life has been mostly concerned with the welfare of farm animals, and much of the following comes from this perspective. However, it might be useful to consider the ideological problems of using cloned animals in animal production when addressing issues of morality in the use of cloned animals in laboratory animal research. Official positions on the morality of using cloned animals for our use are sparse. European Food Safety Authority (EFSA 2010) has reported scientific opinion regarding animal cloning with respect to food safety, animal health and animal welfare, but not the morality of the use of animal cloning. From an admittedly limited telephone survey of animal welfare centres (national reference points for questions on the welfare of animals), in the Scandinavian and wider Nordic region, none reported an explicit position with regard to the ethics of the use of cloned animals and to their welfare.

Cloning is here understood to be as described by the European Food Safety Authority (EFSA 2010), the replication of "the genetic make-up of the animal from which the cell was taken to produce a cloned offspring. It is different to genetic modification, which alters the characteristics of animals by directly changing the DNA sequence". It is to be distinguished therefore from gene editing. Since the cloning of the first vertebrate, the frog *Xenopus laevis laevis* nearly sixty years ago (Gurdon 1962) and of the first mammal, the mouse, forty years ago (Illmensee and Hoppe 1981), Dolly the sheep, from adult cells in 1996 (Wilmut et el. 1997) and slightly earlier, in 1995, from embryonic cells to produce the cloned sheep Megan and Morag (Campbell et al. 1996) there have been tremendous advances in the range of species that have been successfully cloned. These include

the horse (Galli et al. 2003), the ferret (Li et al. 2006), the dog (Lee et al. 2005), the cat (Yin et al. 2008) and a cloned dairy calf (not the first) at my own institution in 2013.

Although reporting some time ago, Fiester (2005) and Lassen (2005) both identified a disconnect between public/researcher dialogue of the ethics of cloning and the pace of advances in animal cloning. Furthermore, the public and legislative bodies may also be out of step, at least regarding the use of cloned animals in the agricultural sector. At the governmental level, in the UK, there is limited labelling of products and controls on cloned animals, their offspring, and their products, implying that the UK Government favours the development of animal cloning technology (Petetin 2012). And what makes this lack of engagement odd is the public's often-reported negative view of the cloning of animals. In the UK 91.5% of the population sampled responded, contrary to their Governmental opinion, that there should be labelling of products from cloned animals (Eurobarometer 2008). And it is not simply a reflection of those that are opposed to the use of animals for research purposes. Compare the 64% of Americans who think that animal cloning is morally wrong, double that of the 32% of Americans that think that medical testing with animals is morally wrong (Fiester 2005). And 61% of Europeans, rather more in each of the Scandinavian countries, consider that animal cloning is morally wrong (Eurobarometer 2008).

Is this simply a problem of the public being ill informed? It is a commonplace belief that a knowledge gap between public awareness of practices involving animals, the understanding of the reasons why they are treated as they are, and their opinions leads to misconceived conclusions as to the moral permissibility of these practices. But this may be mistaken, as shown for biotechnologies (Lassen et al. 2006) and agriculture (Ventura et al. 2016), where in both cases laypeople were educated in the ways that animals were kept, and the justification for putatively distressing husbandry practices, but subsequently showed no increase in their moral acceptance of these animal practices. Indeed the public may not be so Ill-informed, 80% of Europeans correctly identified the meaning of animal cloning (Eurobarometer 2008). And there is good news for researchers in animal science, at least for animal production, from the same source: "EU citizens rated information provided by scientists about the safety of cloned animals meant for human consumption as the most trustworthy", and this was also true for each of the Scandinavian/Nordic countries individually. So Europeans do understand what is meant by animal cloning, they do trust the information given to them by researchers and they do believe that it is morally wrong.

Purposes and benefits

Intensified and efficient transgenic manipulations, such as the production of human blood clotting factor in sheep have clear benefits, for humans at least, as do genetically identical animal organs suitable for transplantation in humans. And of course, with the removal of genetic variability among sample animals, there will be fewer animals required for breeding programmes and for medical research trials if cloned subject animals are used in such trials. A less welcome corollary might be that the number of animal trials might be expected to increase, so that the total number of animals in use increases. In agriculture advantages can include improved production levels and profitability for farmers, the potential for healthier meat and milk (such as manipulating milk fat content (Heyman et al. 2007)), disease resistant animals (brucellosis in cows (Westhusin et al. 2007)) and reduced environmental impacts (reduced phosphorus in pig manure, through secretion of phytase in saliva (Zhang et al. 2018)). There is potential in using cloned highly productive animals for increased food provision globally, and consequent lower prices for food for consumers. In addition, cloned animals for use in sport (Feister 2005): deer with larger antlers as highly valued trophies for stalkers, faster running dogs, faster racehorses, and to support endangered species, such as the gaur. Also the possibility of resurrecting extinct species from genetic material (Folch et al. 2009), the recreation of beloved pets and disease-resistant non-production animals. So, most of these advantages are for the benefit of humans, but some would improve the welfare of animals. And some are bogus. Providing a convincing argument for the moral goodness of cloning of stags with particularly handsome antlers for hunters' trophies would take some considerably tortuous thinking. If cloned horses race against each other, where is the sporting interest? And the pet will not be the same animal reborn, environmental and epigenetic influences would have to be entirely the same for this to be at all likely. Heðinsdóttir et al. (2018) have reviewed the ethics of cloning dogs. But they might be used commercially, exploiting people's fanciful expectations.

What are the ethical problems?

Feister (2005) has identified two strands to this: negative outcomes for animals, humans or the environment and moral principles. For the first of these there are many outcomes to consider. The pain and distress of handling and isolation of individual animals during the procedures, obstetrical problems for the surrogate animal, the health of cloned animals, placental and foetal abnormalities, as discussed by Kirkden and Broom (2012) and obesity in cloned animals (Inui 2003). Also the exhibition, and transport for exhibition, of cloned animals, their use for research and their use for disease management. Efficiency rates, the number of successful live animals born, remain low although recent efforts have shown how this can be improved (Callesen et al. 2014). There remain concerns of lower life expectancies of cloned animals, with higher mortality rates of cloned piglets before weaning (Schimdt et al. 2015). While a recent review by Burgstaller and Brem (2017) suggests that this might not be a significant problem, they do recognize that available data for different species are sparse. This problem might be exacerbated by unintended effects of intended outcomes; cloning animals that have high growth rates, through higher production rates of growth hormone, can increase mortality and shorten life expectancies. Altering the resource allocation could also have impacts on the health and welfare of animals. If one output, such as production of milk in dairy cows, is increased this can have negative effects on other outcomes such as fertility, maintenance and immunity. There is also the risk that less genetic diversity among a group of animals can leave the animals at higher risk from disease epidemics.

There may be effects on other animals, livestock or wild animal populations, through the unregulated reproduction of cloned animals or unforeseen consequences on the environment. Escapes of fish are particularly likely. The public in Europe (84% of them) are also concerned about the effect of cloned animals on the natural environment (Eurobarometer 2008). The consequences from the reintroduction of extinct animals into the environment may also be significant, but this as an outcome is perhaps rather less likely.

Keeping animals that are clones of each other in groups might be expected to cause problems. The herd of Chillingham cattle has been kept isolated since the middle ages, and are now almost homozygous (Hall and Hall 1988), and physical interactions, particularly between bulls, have been observed to be frequent (Hall 1989). This is not surprising, if the animals are very similar genetically, those of the same age are likely to be of similar size and conflicts to resolve social hierarchical rank may well be unresolved by display alone, leading to increased within-group aggression. For cloned animals then, in a group, of individuals with very similar physical conformation and personality traits, there might be expected to be greater frequency of conflicts over access to food, preferred lying place and so forth than in a group of animals with more genetic heterozygosity.

And the personalities of animals need a closer look. Personality, consistent behaviour shown by an animal over time, has been demonstrated in a large range of animal species, over 60 (Gosling 2001), including the horse (Lloyd et al. 2008) and the rat (Franks et al. 2014) and has been shown to be heritable (Petelle et al. 2015). Animal personality is important for carers and for the respect and valuing of animals' lives, at least perhaps in the eyes of the general public. This is largely anecdotal, but in popular culture animal personalities are important factors affecting our relationships with them. A character in the pandemic film Hot Zone (2019) justifies her father's working in an animal research laboratory on the grounds that he can identify the different personalities of the animals under his care and therefore has a meaningful relationship with them and respect for them. And in the documentary film The Rise and Rise of Animal Rights (2000) the animal activist Keith Mann explains that the animals in his care, sheep, goats, pigs and chickens, all have identifiable personalities and are therefore deserving of our respect. Identification of, and with, individual animal's personalities can be professionally rewarding for the animal carer, and can be a demonstration of the affinity of carers with their animals (Arney and Piirsalu 2017). If cloned animals have the same inherited personality traits, if they all behave in a similar way, the relationship between carer and animal may be damaged, the carers may find their work less rewarding, the standard of care might be poorer and the welfare of both carer and animals impaired. The other side of this coin, it could be argued, is that removing personality differences between animals, and eroding the relationship between the carer and the animals as individuals, might ensure a standard level of care across all animals in a group.

In any case, as concluded by Kirkden and Broom (2012) we should assess the welfare of cloned animals robustly, using established welfare protocols, and include control animals, to check for unexpected, unforeseen outcomes. And these should be in place

for the whole lifetime of the animal, and even into subsequent generations.

There is concern that the use of animal clones may be the thin end of the wedge. When techniques become more reliable and successful outcomes demonstrated, there may be more pressure for their use with humans; the likelihood and ethics of human cloning have been recently discussed (Shafique 2020). That this would be undesirable is putatively a widespread view.

Our attitudes to animals may become altered if animals are perceived to be less natural, more artificial constructs, and our concern for their wellbeing might diminish as a consequence. Of course, we have been breeding animals systematically since Bakewell in the 18th century for our benefit. But there is a difference between using the material inherent in animals and cloning copies of animals. At least, the public make this distinction as discussed above. Do we devalue nature by acting in this way? The integrity of animals, their wholeness of being, and the importance of this from an ethical viewpoint, quite apart from their welfare as it is conventionally understood, has been well described by Röcklinsberg et al. (2014) who write: "The integrity of the animal is thus violated when the animal is designed to serve human needs instead of being left to develop or fulfil its own species-specific goals". The public may not be able to adequately describe and evaluate the moral distinctions that they make in this regard, but the public has "Wisdom of repugnance", people believe that it is morally wrong without being able to describe convincingly why they think it is so. While this might not be rational, it is something that researchers should be aware of. Does cloning make us think of these animals as things and not sentient creatures worthy of our admiration and empathy? Does it make it more likely that we think of them merely as products rather than living sentient beings with inherent value beyond that of their purchase price and/or potential production value?

Some justifications

Any ethical concerns there might be that are associated with the husbandry of cloned animals should be considered in the light of the usual practices for these animals, in both agriculture and in animal research. It should not be expected that cloned animals be cared for and protected at a higher standard than is common practice for conventionally bred animals. But, common practice with animals, on farms or in laboratories, may not be considered to be morally acceptable, in particular from an animal rights viewpoint. And in which case animal cloning in these contexts is also morally unacceptable. If we choose to confect a utilitarian calculus of the ethical acceptability of the use of cloned animals we should include an analysis of the benefits of cloning animals to weigh against the problems associated with them. And as cloning efficiency and cloned animal health improve, this will increase acceptability, tipping the utilitarian balance further toward the ethical rightness of the use of cloned animals. But this does not mean that the trivial use of animal cloning, or indeed the use of animals for which actual or expected benefits do not outweigh consequent suffering of the animals, are morally acceptable.

Conclusions

The science of animal cloning, and the increased efficiency in producing cloned animals that are healthy and can live lives as long as their conventionally-bred counterparts, encourages their use, both in agriculture and in animal science. But the general public are opposed to this use, at least for agricultural animals. There are real benefits that could be expected to accrue from animal cloning, but also real welfare problems and moral concerns. While we cannot necessarily expect the general public to approve the morality of using cloned animals for research purposes more readily if they are better informed, we cannot secrete our work from them. Researchers can expect to be respected if they engage more with the public on this issue. And maybe it is time that we did so.

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Conflict of interest

The author declares no potential conflicts of interest.

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