

Human organs in pigs

by John Harris

1 **T**ruly, you may think, we live in a Brave New World. The news that a combination of stem cell and gene editing technology may soon enable scientists to grow human organs in pigs is cause for serious reflection. Your reaction may boil down to "Yuck!" But there's more to digest. Those organs may actually be superior to human donor organs from either cadavers or from live donation. Double yuck!!



2 It's hardly surprising that the thought of crossing so called "species barriers" should prompt such a virulent combination of distaste and panic. Every fibre of our natural instinct proclaims it taboo. But the reality is that humans and animals have been exchanging bits of their biological matter, intentionally or by chance, naturally or artificially, since time immemorial.

3 We do it in drugs and in vaccines. Diet is a good example. Except for vegetarians, for whom objections are usually rooted in moral issues concerning animal welfare rather than those of species mixing, there does not seem to be any preoccupation with the entry of animal genes, cells, tissue, muscle and other bodily products into our daily metabolism. And we know that diet profoundly influences our bodies at both genetic and epigenetic levels. So really, if one were consistent in maximising the purity of human matter, the diet of choice would be 12.

4 Genetic hybrids have almost certainly always existed naturally. A report by the United Kingdom Academy of Medical Sciences back in 2007 (of which I was a co-author), noted "there are thousands of examples of transgenic animals, mostly mice, containing human DNA".

5 But those who think "yuck" are by no means irrational. For there is a very problematic issue, noted recently by the US National Institutes of Health. They fear that the presence of human cells in the modified animals might "humanise" the animals' brains to the extent that they possessed human sensibilities, cognition, and rationality. Such capabilities would not just merit moral and legal protections comparable with creatures like ourselves — they would demand them. 13, such animals, becoming more human, would have rights analogous to human rights.

6 This, of course, would change our entire conception of our place in the animal kingdom — our entire relationship with the natural world — in ways that the prospect of so-called "full" Artificial Intelligence may change our

attitudes to machines (and theirs to us?). The best combination of evidence and informed scientific opinion so far does not support the idea that these attempts to grow human organs in pigs will result in any "humanisation" of pig brains. But, and here is the crucial point, unless this work continues we will never know the answer to this question for sure.

7 However controversial it may seem, we must pursue the current research to find out how and to what extent this fear of animals with humanised brains really is one we should take seriously. This we can do only by proceeding and carefully monitoring the effects on the brains of the developing animals. But we must also remember that there is a huge issue of human life and welfare engaged here.

8 Harvard's Professor George Church, who has led research on chimeras – as human/animal hybrids are known – suggests that "gene editing could ensure the organs are very clean, available on demand and healthy, so they could be superior to human donor organs". If he is right the prize is enormous in terms of human health and happiness. In the US, an average of 22 people die each day waiting for transplants that can't take place because of the shortage of donated organs. In the UK the figure is three people a day (a thousand people per year) who die waiting for a transplant. Globally, preventable deaths for want of donor organs and tissue run into hundreds of thousands. Therapy delayed is therapy denied and that denial costs human lives day after day.

9 Of course, pursuing this research will cost animal lives and this should not be taken lightly. But no society that permits the eating of meat can consistently object to animal research directed to human health and safety.

10 There is no good reason, either in the sense of "adequate" or "moral", for not pursuing the science to the point at which we are able to judge just how safe or unsafe using such techniques in animals, or their fruits in humans, will be.

11 In fact, in the end the ethical issues may not be the ones many now fear, with the creation of talking and thinking pigs – but one where limitless safe organs and tissue transplants allow humans to live healthy, fit and productive lives well into what is currently considered "old age". The question then will not be "when is a pig too human" but "when is a human too porcine"?

12 My bet is that the resulting creatures, if they are living long, fit and healthy lives, untrammelled by failing bodies, will not be worrying about the semantics.

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adapted from *The Daily Telegraph*, 2016