

To what extent does societal ignorance contribute to conflict over Reprogenetics?

***Why I chose this topic:** Public conflict over reprognetics has been around for a long time, taking many forms including marches, protests and anger towards policy decisions. This importance of this debate is mounting as genetic technologies advance rapidly, enabling genetic interventions that were not possible a decade ago. A transparent approach to public dialogue must be taken in order for the public to understand both sides of the argument.*

Introduction

Reprogenetics is a term used to encompass the field of research involving the creation, use, manipulation, or storage of gametes or embryos (Parens and Knowles, 2003). In this essay reprogenetics will refer more specifically to selection and genetic modification of embryos for the purpose of human enhancement, as this is where the majority of conflict lies. This essay will first investigate the prominence of this debate, as well as the opinions and concerns held by the public contrasted against the arguments of scientists and research councils that typically refute these opinions. The extent to which ignorance is a cause for conflict shall be assessed, while accounting for other contributions to the conflict, such as the unwillingness of scientists to engage the public and inaccurate media portrayal. The recommendations of research councils on how to consult the public will also be outlined, as these suggestions will be pertinent in resolving conflict. I argue that the origin of conflict over reprogenetics can be attributed, at least in part, to societal ignorance, but may also be exacerbated by inaccurate media portrayal, a lack of transparent public dialogue, and scientists' lack of desire to communicate their research.

Prominence of the debate

The discussion around reproductive research is far from novel - take the examples of Preimplantation genetic diagnosis (PGD) and mitochondrial replacement therapy. PGD, the testing of chromosomal make-up of an embryo in order to select the required gender of a child, now boasts a 'nearly 100%' accuracy rate for gender selection (Genetics & IVF, 2017). More recently, mitochondrial replacement therapy was legalised in 2015 in the UK (Tachibana et al., 2013). Both of these methods involved huge debates in government, policy makers, and the public. The recent explosion of interest in CRISPR-Cas9 may have an even more profound implication in the field of reprogenetics on account of the unprecedented ease, cost, and precision it can bring to genetic engineering (Dounda and Charpentier, 2014). Hence, this technique increases the urgency at which these ongoing ethical debates must be resolved. There is a vast array of arguments, outlined by

Baylis and Robert (2004), both for and against the use of reprogenetics, each demonstrating varying degrees of legitimacy and scientific understanding.

The arguments of the public

The 'playing god' argument against the use of reprogenetics highlights that the physical, intellectual, and psychological well-being of future generations should not be in the hands of humans themselves (Baylis and Robert, 2004). This view is often held by religious groups that believe in natural and divine laws, stating that the use of genetic enhancement is an attempt to usurp God's authority (Ramsey, 1970). While this argument may be confined to religious groups, it does not take in to account that any scientific research in this area is designed with the intention of helping humans, and in the case of genetic diseases – potentially alleviating suffering, as opposed to defying the authority of deity. Moreover, this argument is only upheld by religious groups, and therefore does not give a holistic argument against the use of reprogenetics as it's only from a minority perspective.

A second cause for concern among the public is the introduction of a threat to genetic diversity. People have argued that genetic enhancement technologies, in selecting for characteristics, may have a deleterious impact on the human gene pool. However, research is largely unanimous that there is not possibility of any significant reduction in genetic diversity (Pence, 1998). Having said this, it is impossible to know how far reprogenetic technology will be taken. Legalisation, if the technology is deemed feasible, will likely be restricted to a very limited number of practices at first, but there is no way of governing its use to stop people selecting for more mundane physical traits as the technology spreads globally. In this case it is unreasonable to completely rule out a reduction in genetic diversity, hence the argument may be legitimate, but is very extreme in its assumptions.

Further reasoning of people against reprogenetics is the worry of amplifying social injustices. They argue that the technology will only be available to those of economically advanced states, creating an even bigger divide between the well off and the less so, as well as aggravating existing issues such as population density and ageing populations. However, these issues will only arise if, and only if, the technology is capable of genetically enhancing embryos to give rise to these traits such as age resistance. Also, it is highly unlikely that selection for mundane traits will ever be legalised due to the obvious ethical implications, meaning any selection of this kind would be illegal. Again, the trepidations of the public seem to assume a worst case scenario approach, as there is no evidence as of yet pointing towards these extreme capabilities of the

technology. Having said this, there is a reasonable case to be made that if reprobogenetics only becomes available to an affluent minority then this is not a fair distribution of the technologies.

The need for discussion

Despite the difference in opinion between members of the public and the scientific community, scientists and research councils seem to recognise that the public have an interest in this area. Many journals and statements from councils such as BBSRC and Wellcome Trust have unified in calling for early and open engagement about the future of genome editing with policy makers and the wider public (NCO Bioethics, 2016). For example, Baltimore et al. (2016) argue it would be wise for a discussion that bridges the research community, regulatory bodies and the public to explore responsible uses of the technology. Further to this, they revisit the fact that the most important lesson we learnt from the dawn of the recombinant DNA era, is that public trust in science begins with and requires ongoing transparency and open discussion. Despite much open discussion still to come, many leading academics from the wider community have discussed the inevitability of germline engineering, regardless of any upheaval from the public (Bosley et al., 2015).

Possible Solutions

The Nuffield Council on Bioethics compiled an advisory report that summarised issues and recommendations surrounding the issue of public dialogue on genome editing. They argue that initially, scientists must simply publicise and explain what they have achieved in terms of technological advances. This allows for members of the public to ask questions and interact with scientists with the aim of reducing public scepticism of scientific breakthroughs, hence alleviating the issue of societal ignorance. Furthermore, the Nuffield council argue that when issues over genome editing are raised, the way in which they are presented and understood by the public can have a significant influence on the conclusions drawn about them. This outlines the necessity for clarity in public dialogue, and its role in reducing ignorance.

Origins of Societal Ignorance

Having outlined the arguments of the public against reprobogenetics, and emphasising the solutions to bridging the gap between science and public understanding, it is prudent to detail the causes behind societal ignorance. A survey conducted by the Pew Research Centre (2016) highlights the huge gaps between the views of scientists and the public on topics such as genetically modified foods and climate change. The survey emphasises the wider problems with scientists not conveying their research accurately with the public. Many

people, including scientists themselves, support this claim that the onus is on the researchers to communicate their work effectively. Work by Pham (2016) also references the Pew survey to illustrate the stark differences in opinions between scientists and the public. He reasons that scientists' lack of desire to communicate science creates major problems for the community, as it is challenging to generate support from the government and the public if they do not understand the relevance of the research.

Societal ignorance may also be attributed to misleading media portrayal of important science breakthroughs. Many news outlets, despite not being renowned for their science journalism, choose to publish articles on top science stories, which are posted on social media and their online platforms and read by a huge proportion of the public (National Readership Survey, 2016). Many articles are written purely to attract readers, with bold headlines and misleading content. The comments sections on some of these outlets gives an indication of how people are interpreting these articles. In one example of a comment taken from a Daily Mail article about the potential of CRISPR Cas9 to one-day treat genetic disease, the reader described the technique as 'more disguised eugenics'. This highlights the two key problems that I argue contribute to ignorance – firstly news outlets omitting the scientific evidence behind the claims, and secondly the lack of understanding in the public which inhibits some from intelligently questioning the material they are reading.

Conclusion

As progressions in rerogenetic technology become increasingly frequent, so should the urgency ascribed to transparent public dialogue aimed at augmenting public understanding of rerogenetic technology. Thus, we can begin to eliminate societal ignorance towards science and subsequently reduce the conflict and tension between the scientific community, policy makers and the general public. The current arguments against use of rerogenetic technology, while being partly based on some truth, assume a worst case scenario and often overlook the potential positive applications. Academics and research councils have begun to appreciate the need for dialogue. Some, such as the Nuffield council for Bioethics, have even gone as far as to recommend the best forms which this dialogue should take. While there are many varied causes of societal ignorance, I argue that misleading media portrayal of science, coupled with scientists not conveying the research effectively are the major contributors. Therefore, societal ignorance is a major contributor to conflict over rerogenetics, but responsibility can not be assigned exclusively to the public – it must be a duty for the scientists to help address the issue. I believe that there will always be conflict of some scale over rerogenetics, but I imagine that if there was a greater public understanding, some of these conflicts could be lessened.

References

Baltimore, D., Berg, P., Botchan, M., Carroll, D., Charo, R.A., Church, G., Corn, J.E., Daley, G.Q., Doudna, J.A., Fenner, M. and Greely, H.T. (2015) A prudent path forward for genomic engineering and germline gene modification. *Science*, 348(6230), pp.36-38.

Baylis, F. and Robert, J.S. (2004) The inevitability of genetic enhancement technologies. *Bioethics*, 18(1), pp.1-26.

Bosley, K.S., Botchan, M., Bredenoord, A.L., Carroll, D., Charo, R.A., Charpentier, E., Cohen, R., Corn, J., Doudna, J., Feng, G. and Greely, H.T. (2015) CRISPR germline engineering--the community speaks. *Nature biotechnology*, 33(5), p.478.

Braun, K. (2005) Not just for experts: The public debate about reprobogenetics in Germany. *Hastings Center Report*, 35(3), pp.42-49.

Coco, R. (2014) Reprogenetics: Preimplantational genetics diagnosis. *Genetics and molecular biology*, 37(1), pp.271-284.

Couture, V., Drouin, R., Tan, S.L., Moutquin, J.M. and Bouffard, C. (2015) Cross-border reprogenetic services. *Clinical genetics*, 87(1), pp.1-10.

Doudna, J.A. and Charpentier, E. (2014) The new frontier of genome engineering with CRISPR-Cas9. *Science*, 346(6213), p.1258096.

Parens, E. and Knowles, L.P. (2003) Reprogenetics and public policy: Reflections and recommendations. *The Hastings Center Report*, 33(4), p.S1.

Hauskeller, M. (2017) Rethinking Reprogenetics. *Hastings Center Report*, 47(2), pp.50-51.

Holtug, N. (1993) Human gene therapy: down the slippery slope?. *Bioethics*, 7(5), pp.402-419.

Marincola, E. (2006) Why is public science education important?. *Journal of translational medicine*, 4(1), p.7.

Nuffield Council on Bioethics, (2016). *Public dialogue on genome editing Why? When? Who?*.

Pence, G.E. (1998) *Who's afraid of human cloning?*. Rowman & Littlefield Publishers.

Pham, D. (2016) Public engagement is key for the future of science research. *NPJ Science of Learning*, 1, p.16010.

Ramsey, P. (1970) *Fabricated man: The ethics of genetic control* (Vol. 6). Yale University Press.

Tachibana, M., Amato, P., Sparman, M., Woodward, J., Sanchis, D.M., Ma, H., Gutierrez, N.M., Tippner-Hedges, R., Kang, E., Lee, H.S. and Ramsey, C. (2013) Towards germline gene therapy of inherited mitochondrial diseases. *Nature*, 493(7434), pp.627-631.

<http://www.nrs.co.uk/latest-results/nrs-padd-results/newspapers-nrspaddressults/> Readership figures

<http://www.givf.com/familybalancing/> - Genetics and IVF, 2017.

<http://www.pewinternet.org/2016/07/26/u-s-public-wary-of-biomedical-technologies-to-enhance-human-abilities/> Pew research centre