

This response was submitted to the Call for Evidence held by the Nuffield Council on Bioethics on *Genome editing* between 27 November 2015 and 1 February 2016. The views expressed are solely those of the respondent(s) and not those of the Council.

Genome Editing: Open Call for Evidence

Submission by the Mission and Public Affairs Council of the Church of England

The Mission & Public Affairs Council of the Church of England is the body responsible for overseeing research and comment on social and political issues on behalf of the Church. The Council comprises a representative group of bishops, clergy and lay people with interest and expertise in the relevant areas, and reports to the General Synod through the Archbishops' Council.

The Mission and Public Affairs Council presents a Christian ethos, drawing on the witness of the Christian Scriptures and reflecting on Christian tradition and contemporary thought. Belief in God as Creator and Redeemer, in human beings' intrinsic value as creatures made in the Image of God and in the imperatives of love and justice, underpins the Council's approach. The Council believes that the ethical and social principles developed from this foundation have a value and relevance in society that can be acknowledged by those of other faiths or none.

Introduction

1 We are grateful for the opportunity to respond to this consultation and note that participants have been advised that they can respond to those parts of the consultation that are most relevant to their interests or areas of expertise. Accordingly, our comments focus on the section, 'Perspectives on Genome Editing', concentrating specifically on human genome editing. We recognise, however, that some of our comments may also have relevance to plant or animal genome editing. Much of what we say is also pertinent to the section, 'Biomedical Research and Human Applications'.

2 There is much current interest in human genome editing and some pressure from researchers to move quickly in this area (as was evident at a major conference on human genome editing organised by the Progress Educational Trust in London, December 2015). This is understandable, given the potential benefits that might accrue from future clinical applications of the technique. We believe strongly that, as with previous discussions on human fertilisation and embryology such as IVF, embryo research and mitochondrial donation, it is essential that this topic is thoroughly and carefully explored before any change in legislation is considered. Consequently, our response will attempt to indicate issues that require thorough examination along with suggestions of how these topics might best be tackled, rather than indicating a fixed position at this early stage of discussion.

3 It is important that human genome editing is not treated in isolation as a totally unique topic, but is set within a wider framework of bioethics. While there are challenges uniquely associated with genome editing, these are not of such a distinctive nature that a general, principled approach to bioethics cannot be applied to this subject. Accordingly, we will approach the topic by employing an analytical framework that we would apply to any potential bioethical

innovation, examining issues of safety, efficacy, ethics and prudence, before responding to some of the ‘indicative questions’ listed in the consultation.

A Framework for Analysis

Safety

4 This is often viewed as a matter for scientists and clinicians to determine, but issues of safety are far-reaching and require the involvement of others outside research and medical communities. While it is clear that research (and any subsequent clinical applications) ought not to place human participants at notable physical or mental risk, it is less clear where the line is to be drawn for ‘notable risk’ or who or what might be considered as ‘human participants’. It is also important that this discussion includes social as well as physical and mental aspects of safety.

5 Few intrusive clinical procedures, conducted either for research or directly for therapeutic purposes, are entirely risk-free. Procedures necessary for obtaining ova for research or treatment, for example, carry an element of risk to donors, but these are deemed by the HFEA and others to be within acceptable limits. Similarly, the level of risk for IVF procedures is now well documented and closely monitored with participants enabled to give informed consent. Conversely, the necessary benchmarks for mitochondrial donation have not yet been reached. It is essential that margins of risk are clearly established for all participants in genome editing research and clinical application and that no procedures are authorised until it can be demonstrated that they fall within acceptable risk levels. Parliament needs to be assured (within the UK legislative and regulatory framework) that such is the case.

6 In genome editing research, the ‘participants’ are early embryos (pre-embryos in some literature). While the use of embryos for research purposes is legal in the UK this does not mean that the practice is unproblematic. The Church of England acknowledges that embryo research aimed at improving therapeutic outcomes for others can be acceptable in some circumstances, but insists that all human embryos ought to be treated with respect and their distinctive status recognised in keeping with HFEA Code of Practice, Principle 3: *[to] have proper respect for the special status of the embryo when conducting licensed activities*. It is becoming increasingly difficult to discern what ‘proper respect’ means when large numbers of embryos (particularly in relation to those which have been created purely for research purposes) are used in experiments and then discarded. If human embryos were to become routinely viewed as commodities for experimentation or as a simple means to an ends, this has the potential to have a detrimental effect on the ways in which human life is valued in society. The debate on genome editing presents another significant opportunity for society to review its understanding of the human embryo and to reaffirm ways in which the embryo can be accorded special status and treated with respect.

7 If genome editing were eventually to result in clinical procedures being authorised, the need to protect all participants from unacceptable risk is paramount. This must include donors, prospective parents and, primarily, prospective children. The emotional pull to seek to ensure that children are born without debilitating or life-limiting conditions must not outweigh the need to ensure that emerging techniques are used only if the risk of introducing other debilitating conditions to children and their offspring has been effectively precluded.

8 The social risks associated with introducing clinical treatment that might be available only to some prospective parents (particularly if treatment is to become primarily available through the private sector, as is currently the case with IVF), must not be minimised. The potential for increasing social disparity is a real one that needs to be realistically analysed and satisfactorily addressed prior to any change in clinical practice being introduced.

9 Similarly, the potential impact of genome editing on societal attitudes to disability requires careful consideration. While it would be wrong to suggest that minimising or eradicating some causes of physical impairment ought not to be pursued because of such concerns, the issue deserves to be thoughtfully examined.

10 The borders between treating illness and enhancing human health are porous as are the borders between enhancing health and enhancing human performance/attractiveness. Vaccination, for example does not treat illness, but enhances the human body to resist infection. Similarly, nutrition does not only have an effect on health, but also on physical and mental performance. If genome editing were to become a clinical reality, the implications for human enhancement would need to be fully explored alongside the potential for furthering social disparity noted above. It would be an extremely difficult task to know where to draw the line along the continuum from treatment of illness to performance enhancement, but lines would have to be drawn to identify and to avoid unacceptable uses of genome-editing techniques.

11 Ensuring that the offspring of any ‘genome-edited’ children will not suffer any detrimental effects is a major safety concern. By definition, it is not possible to know how subsequent generations of children might be affected until they exist. Animal experimentation cannot provide a sure guide in all instances. This has the potential to become a significant obstacle in introducing genome editing for clinical purposes unless convincing evidence can be produced that any associated risks have been minimised. Equally, a watertight guarantee would have to be put in place that any emerging problems would halt the continued use of the technique until they are fully resolved.

Efficacy

12 It is essential that, from the outset, each application for research and any subsequent clinical procedures are absolutely clear in what they might realistically achieve. Equally, public discussion of the potential for genome editing to address illness must be measured. Potential clinical applications of genome editing must be explained and discussed in detail rather than promoted with generic claims ‘to wipe out’ certain medical conditions. (To achieve this aim, every potential parent in the world would have to undergo genetic profiling and every potential mother would have to agree to IVF; clearly an unrealistic prospect.) Prospective parents must not be given false hope and raising expectations which are not likely to be met for many years should be avoided.

13 Genome editing will neither significantly affect the numbers of healthy children to be born nor will it affect the health of existing children; these realities need to be widely understood. Preimplantation Genetic Diagnosis (PGD) already provides a well-tested means by which clinicians may select ‘healthy’ embryos for IVF implantation while gamete donation from a third party enables potential parents, diagnosed as ‘high-risk’, to give birth to healthy children. There are, however, circumstances in which PGD is not effective and genome editing could enable some prospective parents to give birth to their genetically related children where a

defective gene would otherwise be passed to all of their offspring. The choice that genome editing can be said to offer is not between a healthy and an unhealthy child being born, but between a healthy child that shares its parents DNA being born and a healthy child being born that has some of its DNA from a donor.

14 Many medical conditions are caused by an interplay between numbers of genes. Currently, the mechanisms underlying these processes are poorly understood and may not be remedied by current genome editing techniques. Additionally there may be interactions between genes which do not come to light for several generations and are only observed through population studies. At the very least, much greater research into the inter-relatedness of genes is required before the clinical application of genome editing is likely to prove efficacious (or safe) in all but a few cases.

Ethics

15 Issues of safety and efficacy have ethical implications, but there are additional ethical concerns that need to be explored in a discussion of genome editing, before changes in practice or legislation ought to take place.

16 The Church of England has, in recent years, applied four principled questions to bioethical issues: what course of action might best be seen as life-affirming? Which best cares for vulnerable people? Which best contributes to building a cohesive and caring society? Which best respects individual freedom? The Church has applied these criteria in the priority order listed above.

17 Affirming life requires an examination of the nature and value of human life and the limits that ought to be set for intrusion into both the life process and individual human lives. While it is customary for many to value life in instrumental terms or in terms of the value an individual might set on his or her own life, the Church of England has argued that life ought to be viewed in a wider context and that human life has an intrinsic value apart from its instrumental use or the value set on it by individuals themselves.

18 This means that we ought to view life both as set within the whole environment of human relationships and as part of a continuum from one generation to another. Humans move along a spectrum that begins biologically with human genetic material arising from their parents (gametes) becoming separate, though dependent, human life (zygotes). Individuated human life emerges after the blastocyst stage and eventually individual human persons emerge, although there is no agreement when this final stage is first reached. What value a human life is to be given, cannot be determined by taking a simple 'snapshot' of where that life is on the spectrum at a given moment. Both potential and history ought to be taken into account: a much sought child at the embryonic stage is more than 'a collection of cells' to its parents, just as a much loved relative in end-stage dementia is much more than 'a shell' to his or her family. At the very least, human embryos ought not simply to be seen as routine means towards an end, created purely for the purposes of research; we need to reflect on the ethics of bringing human life into existence in order to experiment on it and then end it. While a positive case can be made for using 'spare' embryos for research: ones that had been originally intended for reproduction but which, for various reasons, could not be implanted, we must take great care over the impact that genetic editing research might have on the value that we place on human life.

19 Currently, experiments on living foetuses are not permitted, but in order to test the viability and efficacy of genetic changes made to embryos there is a real possibility of pressure to allow some of these to develop to the foetal stage, before licensing the technique for reproductive purposes. The desire by some researchers to extend the moratorium on research beyond the current 14 day limit is a cause for concern. The present limit recognises the importance of the emergence of the ‘primitive streak’ heralding the beginning of neural development; regardless of one’s views on the status of the embryo and foetus, it is reasonable to argue that as development proceeds along the human life continuum, increasing care ought to be taken with regard to how it is treated. If the beginnings of neural development do not provide a watershed for research, it is difficult to see where else the limit might be placed.

20 To argue that human life has an intrinsic value apart from its instrumental use or the value placed on it by individuals is not, in itself, to determine what that value is, but it is to assert that there is something unique and special in being human. Christian theology grounds this in the concept of the Image of God, but it is not necessary to employ this religious understanding of human life to agree that human life is, in some respects at least, distinctive from other forms of life. That human life has an intrinsic value that ought to be respected, is an innate understanding of many while it underlines much of human rights and criminal law as well as health and social care and can only be abandoned at our peril.

21 Caring for the vulnerable covers a wide variety of interests including prospective donors, parents and children. While it might be contentious to claim that embryos are vulnerable (and if they are, they are not vulnerable in quite the same way as adults or children), the possibility of extending the current 14 day limit for research brings into focus the ethics of deliberately creating, utilising and truncating human life even if these early biological lives are not to be equated with human persons.

22 Caring for the vulnerable must also be reflected in the ways in which those who donate gametes or embryos for research are given full and accessible information with regard to the use to which their donations will be put. It also requires the recipients of any clinical treatment to be made fully aware of associated risks and limitations as well as of the means whereby their treatment became possible through the use of embryo research. For many people this might not present an ethical problem, but for some it will and they ought to be given this information as part of the consent process

23 Paramount, of course, is the welfare of any children (and their offspring) that might be born, following genome editing. This welfare extends to psychological and social aspects of their wellbeing. Tremendous care needs to be taken to ensure that every aspect of their health and wellbeing is explored before any treatment ought to be authorised.

24 Building a cohesive and caring society is close to the heart of every civilised State and many advocates of genome editing view the technique as having the potential to contribute towards achieving this goal. At the same time, it is essential that all aspects of the potential implications of genome editing for society are fully explored. The ‘law of unintended consequences’ has an inexorable habit of exercising its influence. As previously stated, issues of social disparity, attitudes towards disability and the boundaries between treatment, health and performance enhancement require rigorous examination. Allocation of resources to genome editing over against other techniques that address some of the same issues such as stem cell research needs also to be carefully weighed.

25 Respecting individual choice is an important aspect of health care and is enshrined in the NHS Constitution. For some, however, it has become the over-riding principle which all others serve. We suggest that, while respecting individual autonomy, the exercise of such autonomy must be principled and that the context for principled autonomy is set by the affirmation of life, care of the vulnerable and the creation of a cohesive and caring society. Clearly, this places limitations on the freedom of individuals and the amount of resources that ought to be utilized in enabling them to pursue their aspirations within a framework that promotes the common good.

Prudence

26 Even if all safety, efficacy and ethical issues were resolved the question would still remain: is it wise to proceed? Human nature and human societies have a way of producing unexpected outcomes from innocuous or well-intentioned innovations. Measures undertaken for apparently good immediate benefits can, over time, cause a shift in social attitudes which is deleterious and may even undermine the altruism which gave the initial motive for the development. Clinical innovation and changes in legislation, if any, ought to be introduced through the democratic process with ultimate decisions being made by parliament, following widespread, detailed and informed public debate. Human genome editing is, arguably, the bioethical equivalent of splitting the atom; we ought to proceed with very great care to maximise the benefits for society and guard against its misuse.

Indicative Questions on Perspectives on Genome Modification

The distinctive significance of genome interventions

Q. Is there anything special about the genome that makes intervening in it different from other ways of manipulating nature (e.g. selective breeding of plants or animals)?

A. With regard to human beings, 'selective breeding' is an impractical, ineffective and unethical way to attempt to modify subsequent generations. If sufficiently developed, genome editing would make targeted genetic change possible in a manner that could prove to be practical, effective and ethical if the considerable difficulties outlined above were to be overcome.

Q. To what extent can the development of genome editing techniques be regarded as distinct from or continuous with existing techniques? In what way are the differences significant?

A. As noted above, current changes made to the human embryo in research projects are not permitted to develop beyond the 14 day stage. While initial genome editing research on human embryos would also not cross this limit, pressure is likely to arise to test the safety and efficacy of the techniques by allowing embryos to develop to the foetal stage. Developing foetuses for experimental purposes crosses an ethical Rubicon. Already some scientists suggest that the 14 day limit ought to be relaxed to enable fuller research to take place, but if experiments on early foetuses, in which neural development has begun, are allowed, it is difficult to see where next a line ought to be drawn.

Science and society

Q. What obligations do scientists involved in developing and using genome editing technologies owe to society and what freedoms should society allow to these scientists? Do genome scientists have any special obligations to society that are distinct from those of other scientists?

A. Scientists are part of society and have precisely the same obligations, responsibilities and freedoms as all other members of society. It would be a grave mistake to place scientists in a separate ethical enclave. It is up to society as a whole to determine the limits and freedoms that ought to be placed on scientific research.

Q. To what extent is the development of genome editing valuable as a pure research tool, and to what extent is its value dependent on envisaged practical applications?

A. If treating the human embryo with respect is to have any value, research on human embryos, including research into genome editing, ought to have therapeutic applications as its end-goal. To utilize human embryos in order to gain further knowledge without an intention to incorporate this knowledge into practical outcomes is to objectify the embryo totally.

Q. What obligations do governments have towards society to ensure 'safe' science or otherwise to shape the scientific research and development?

A. While absolute safety is seldom achievable, governments have a responsibility to ensure that scientific and clinical techniques are made as safe as possible. In the case of human genome editing, the bar must be set high as the potential for causing serious harm is substantial.

Science, morality and law

Q. What conventional moral principles, if any, does genome editing challenge?

A. Human genome presents a serious challenge to principles based on natural law, but it also presents a myriad of moral challenges as outlined in the ethical framework presented above.

Q. To what extent can the moral questions raised by genome editing be addressed using existing moral frameworks or approaches?

A. Please see the section on ethics above.

Q. To what extent are laws and legal frameworks necessary or desirable in seeking to ensure adherence to the moral principles that should inform genome editing?

A. It is essential that legislation defines which practices are deemed to be acceptable and which are deemed to be unacceptable, on the basis of the framework outlined above.

Indicative Questions on Biomedical Research and Human Applications

Q. What bearing do international ethical debates and agreements (e.g. high level statements or calls for moratoria) have on the pace or organisation of research?

A. Such debates probably have a greater impact outside the UK than within it as the UK is not a signatory of the Oviedo Convention. The UK currently plays a leading role in genetic research and there is pressure from and among researchers to maintain this status. The pace of research is more likely to be dictated within the UK by an internal debate rather than by the international one.

Q. Who should lead and who should be involved in setting policy for research and human applications of genome editing? Is this significantly different from other kinds of experimental or reproductive medicine?

A. Parliament should take the lead, supported by the HFEA. It is essential that a detailed and informed debate takes place prior to any revision of policy.

Impacts

Q. What are the significant decisions that need to be taken before therapeutic use of genome editing may be contemplated (for non-heritable and heritable genetic changes) and who should have the responsibility for those decisions?

A. We have outlined these in the introductory section below. Parliament ought to make such decisions following a detailed and informed debate.

Q. Are the benefits and costs of treatments that involve genome editing likely to be distributed equitably (or any more or less equitably than existing or alternative treatments)? In what way might genome editing differentially affect the interests of people in vulnerable or marginalised groups?

A. As it is likely that genome editing techniques will be practiced predominantly by private providers, as is currently the case with IVF treatments, there is a significant risk of increasing social disparity, as outlined above.