This response was submitted to the call for evidence by the Nuffield Council on Bioethics on 
Emerging techniques to prevent inherited mitochondrial disorders: ethical issues between January 
2012 and February 2012. The views expressed are solely those of the respondent(s) and not those of 
the Council.

Nuffield Council on Bioethics consultation on mitochondrial donation

Response of the Anscombe Bioethics Centre

Summary

0.1 PNT and MST are unethical as they cross the line to germline genetic engineering
0.2 PNT involves reproductive cloning
0.3 PNT involves destruction of two embryos
0.4 MST involves three genetic parents
0.5 PNT engineers a child with genetic ancestry but without genetic parents
0.6 The only way to “promote ethically sound practices” in this area is to prohibit both practices
0.7 We urge the Nuffield Council not to accept the licensing of this technique as a fait accompli

1. Is it acceptable, in this instance (PNT and MST), to select genes that will then be inherited by 
future generations?

1.1 Any intervention that attempts to alter the genetic makeup of future generations is a form of 
germline genetic engineering and is problematic for this reason (in addition to further ethical issues 
with these particular techniques). PNT and MST constitute germline engineering insofar as the aim 
is to create offspring who will not be affected - and whose own offspring will not be affected - by 
mitochondrial conditions. (In contrast, PGD is not a form of genetic engineering but is rather a form 
of systematic discrimination against de-selected embryos).

2. What ethical distinctions can we make between prospective treatments which would:

   a. transfer pronuclei between embryos?

   b. transfer the nucleus of a cell between embryos?

   c. seek to modify the nuclear DNA of an embryo?

2.1 There seems no significant difference between PNT and cell nuclear transfer (CNT). In both cases 
it is the nuclear DNA that is transferred from one embryo to another. The pronuclear stage of 
embryonic development is not ethically (or, indeed, legally) different from the two cell stage. PNT 
has in common with CNT that this technique is a form of reproductive cloning – in this case, from an 
embryo. The Human Reproductive Cloning Act 2001 made it an offence to place in a woman “a 
human embryo which has been created otherwise than by fertilisation”, with a penalty of up to 10 
years imprisonment. PNT would be illegal had the law against reproductive cloning not been 
repealed by the Human Fertilisation and Embryology Act 2008. PNT should be considered unethical 
because, in addition to the problems of germline genetic engineering which it shares with MST, PNT 
is a particularly destructive form of human cloning.

2.2 PNT involves the destruction of the embryo from whom the pronuclear material is taken and the 
destruction of a host embryo (by the removal of its own pronuclei). From the perspective of respect 
for the embryo this represents a further degradation. The Human Fertilisation and Embryology Act 
1990 was enacted with the stated aim of expressing a degree of respect for the special status of the 
human embryo. Regrettably, this special status in law is not equivalent to that of older human 
beings; however, this legal status and the embryo’s higher status (we believe) in ethics is very
relevant to PNT. In no other procedure is the destruction of a human embryo the necessary precondition of each individual fertility treatment. The deliberate destruction of two human embryos cannot be justified by the wish to have a child who is (selectively) genetically related to the intended social parents.

2.3 The attempt directly to modify the DNA of a human embryo does not involve cloning and does not necessarily involve embryo destruction at the point of use, though it would involve prior destructive embryo experimentation. However, such an attempt would be the most direct and overt form of germine genetic engineering, as condemned by many international instruments.

3. Is it reasonable to use experimental techniques such as these in treatment?

3.1 The experimental character of these techniques draws attention to the health risks for women and children, as well as future generations. This is an important ethical consideration, though still secondary to the more fundamental considerations in regard to deliberate embryo destruction, cloning and/or replacement or disruption of parenthood. It must be remembered that couples who, understandably, do not want to take the risk of passing on mitochondrial disorders to their children can avoid this risk entirely by avoiding conception and, perhaps, exploring adoption as a less destructive and more humane alternative.

3.2 If PNT and MST were permitted this would cross the line to germline genetic engineering. PNT would also involve reproductive cloning. PNT and MST could therefore serve as a precedent for other forms of germline genetic engineering and reproductive cloning, but the ethical problems would not only be those created by a slippery slope effect, real as these would be. Nor would they only be a matter of physical or psychological adverse effects the child might undergo or pass on to future generations, serious as such effects would be. This level of reproductive genetic intervention is, we believe, inherently unethical, in that it fragments or replaces genetic parenthood in new and radical ways.

4. What might the use of these techniques signify for the relationships of the resulting child to the three adults with whom it shares a genetic connection?

4.1 From a genetic perspective the child of MST would have three parents: a genetic father and two genetic mothers. The mitochondrial mother provides an element of inheritance that is special to the female line - a distinctive maternal genetic contribution. The child of PNT would have genetic ancestry but no genetic parents, and no immediate living precursors. He or she would be a clone created from the deliberate destruction of two embryos.

4.2 Apart from the embryos destroyed in research along the way to developing either method, ‘successful’ pronuclear transfer will effectively involve destructive reproductive cloning from the original embryo of the woman who wants a baby. This embryo is destroyed when its nuclear genetic material is harvested and placed in the ‘shell’ of a largely-gutted second embryo. This grossly disrespects human life, and the offspring will need to come to terms with the fact that he or she was created from the bodies of embryos created and killed precisely as ‘building blocks’ for him or her.

4.3 We are very far here from the unconditional welcome of new life which having a baby should involve. Even with the less destructive method of MST, the child will face the unknown physical risks
of the procedure in addition to the identity problems of knowing that he or she has, in this case, three genetic parents.

5. How might mitochondrial DNA be associated with a person’s identity?

5.1 Mitochondrial DNA is associated with identity in being inherited through the female line and situating a person within a particular lineage. The significance of this aspect of inheritance is attested to by the very possibility of inheriting mitochondrial disease. The genetic aspect of identity is significant not only in itself and for its impact on phenotype but also because of the human social and cultural relationships it may signify or facilitate. These will be understood differently by different people but they are an aspect of a child’s physical connection with his or her parents or precursors.

6. Could the relationships created between the people involved in these new techniques—particularly between the mitochondrial donor and a person born with their donated mitochondria—be seen as similar to those involved in:

   a. organ or tissue transplantation?
   
   b. gamete donation?
   
   c. a donation of other bodily material?

   Or, should these relationships be seen as unique?

6.1 Such a child would have a unique relationship not reducible to these existing categories; however, with MST it can at least be said that this relationship is more like full gamete donation than like other forms of tissue transplantation, precisely because mitochondrial DNA is inherited and inheritable. Just as the offspring of a full gamete donor may wish to find his or her genetic mother or father so the offspring of three parent MST conception may wish to find his or her mitochondrial mother (especially if it is a girl who will pass on the same inheritance). This possibility will not be open to the offspring of PNT, who will have no genetic parents and (unlike other clones) no immediate living precursors, since the embryos used to create him or her will have been destroyed in the very act of so doing.

7. Would it be reasonable to permit prospective parents using these technologies to also use pre-implantation sex selection (preferring male embryos), if they requested it in order to limit the risks of transmitting any adverse side effects of the techniques to future generations?

7.1 It is the view of the Anscombe Bioethics Centre that PNT and MST are seriously unethical and cross the line to germline genetic engineering. PNT also involves reproductive cloning and further embryo destruction. For this reason no child should be conceived about whom these questions are being asked. However, hypothetically, this proposal would worsen the situation, as involving the deliberate destruction of female embryos with the purely eugenic aim of preventing the transfer of adverse side-effects to future generations. The female embryos in question would not be respected in themselves, but evaluated simply on the basis of their fitness to reproduce.

8. If mitochondrial donation were to be approved for medical treatment in the UK, what government or regulatory policies, and/or professional guidelines would be needed to promote ethically sound practices?
8.1 As stated above, it is the view of the Anscombe Bioethics Centre that PNT and MST are unethical in themselves. The only way to “promote ethically sound practices” is to prohibit both practices, and in particular to prohibit all forms of human cloning, whether for research or whether (as in PNT) for birth.

9. If mitochondrial donation were not to be approved for translation from research into medical treatment in the UK, what ethical concerns, if any, would follow?

9.1 Approval is not, in our view, ethically indicated, and refusing approval for translation from research to medical treatment would not in itself raise ethical concerns. Further discussion of these issues can be found in Helen Watt (1999). “Response to “Germ Line Therapy to Cure Mitochondrial Disease: Protocol and Ethics of In Vitro Ovum Nuclear Transplantation” by Donald S. Rubenstein, David C. Thomasma, Eric A. Schon, and Michael J. Zinaman [CQ. Vol. 4, No. 3]. Cambridge Quarterly of Healthcare Ethics 8 (01). The science has developed since this paper was written but the ethical issues remain relevant.

9.2 As it would be unethical to put the research into practice so it is unethical also to licence the research. In the first place such research, even if it does not involve harm to future generations involves obvious harm to human embryos destroyed in the research. If embryos are created for research, this will also require the harvesting of eggs from women with the attendant risks. The harm to human embryos would be indefensible in itself while the potential harm to women would not be offset by the prospect of benefit, since the research and any clinical application would both be unethical.

10. Is it desirable for a record of the donation to be kept and managed by the relevant authorities, and if so, what should be recorded and to whom should this information be made available?

10.1 It is the view of the Anscombe Bioethics Centre that PNT and MST are unethical and cross the line to germline genetic engineering. PNT also involves reproductive cloning and further embryo destruction. Hence the only way to “promote ethically sound practices” is to prohibit both practices. We urge the Nuffield Council not to accept the licensing of this technique as a fait accompli but to highlight the ethical reasons not to pursue this line of research.

In the highly undesirable event of these procedures going ahead, the adult offspring should have the right to identifying information on the mitochondrial donor.

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