GSP online Genomics, Society and Policy
2012, Vol.8 No.2 pp.29-31

Report Review

Nuffield Council on Bioethics Report: *Novel Techniques for the prevention of mitochondrial DNA disorders: an ethical review* London: Nuffield Council of Bioethics 2012

NINA HALLOWELL[1]

From the first reading I liked this report because it does what all good reports should do: it takes a complex subject – pronuclear transfer (PNT) and maternal spindle transfer (MST) - explains it clearly (chapter 2), considers the ethical pros and cons for its use (chapter 4) in a particular context – the prevention of debilitating mitochondrial disease (chapter 1) - in a measured way and, finally, comes to a clear conclusion: that, subject to the techniques meeting safety and other regulatory requirements, it would be ethical for potential parents to make use of them (in conjunction with IVF) to avoid passing on mitochondrial disease (p.xvi).

Before arriving at its conclusions the working party considered a number of ethical issues including: the implications for identity; risks and safety issues; the impact upon social relationships (parentage and the status of mtDNA donors); germline modification; and implications for the wider society and future generations. As might be expected, given the credentials of the working group members, the discussion of these issues is thorough and thoughtful, and although I may not agree with their final recommendations, these are backed by reasoned argument.

The Nuffield report also makes a series of observations about the potential regulatory and social status of the mtDNA donor and the clinical implementation of these technologies. Regarding the latter, it recommends that if these techniques are used in clinical settings, then long-term follow-up studies of any children born should be carried out. While I agree that we would need a thorough investigation of the intergenerational risks posed by the use of these techniques and that one of the only ways to do this is to undertake longitudinal research, it must be noted that recommendations like this may serve to further blur the boundary which exists between research and clinical activities. The broader societal consequences of increasing the ambiguity in this already tenuous relationship are not considered in the report.

The risks of using these techniques and safety issues are discussed at length in the report, specifically in section 4.66ff and indirectly in other sections in chapter 4. Arguably, this emphasis on these issues reflects the fact that in endorsing the development of PNT and MST for clinical use the Nuffield Council has taken the step of supporting the use of germline modification techniques in humans – germline therapy – (4.35) for the first time. This is a bold step and one that needs, and receives, careful consideration (see 4.28-4.65, in particular).

Genomics, Society and Policy, Vol.8 No.2 (2012) ISSN: 1746-5354
© ESRC Genomics Network.

GSP online Genomics, Society and Policy
2012, Vol.8 No.2 pp.29-31

Born free but still connected

So why would we want to use *in vitr*o mitochondrial transfer techniques if they are so risky and ethically contentious? The working party was of the opinion that the primary reason for using these technologies is that they would prevent harm and suffering by allowing parents to produce a genetically related child who does not have a potentially debilitating or life–limiting inherited disorder (4.1). In contrast to many genetic disorders, which can be avoided by using preimplantation genetic or prenatal diagnosis (PGD and PND), the complex mode of transmission of mitochondrial mutations means that the only way that some (i.e homoplasmic) women can currently have a child who is mutation-free is to use donor eggs or to adopt. They must forgo the possibility of having a genetic relationship with their offspring. The use of PNT and MST would allow both parents to maintain a genetic link with their (mutation-free) child. But this genetic continuity comes at a price, for it is only possible through germline gene therapy, the substitution of the mother's mtDNA. Although the media has described children conceived using these methods as "three parent babies[2]" the Report, having considered the relationship between mtDNA donors and the resultant offspring, concludes that mtDNA donation would not confer parenthood in either the biological or legal sense (5.7). In this way the Report distinguishes mitochondrial donation from gamete donation.

However, while it might be easy to dispel the fears that mtDNA donation will disrupt parental relationships, I am not convinced that this Report leaves our view of familial relationships completely unscathed. Arguably, the report's ethical endorsement of mitochondrial transfer techniques serves to prioritise the genetic relationship with one's children above other types of familial relationship. Women who are at risk of having a child affected with mitochondrial disease are not without reproductive options. Some are able to use PGD or PND, others can use gamete donation or adoption or they can decide not to reproduce. All of these reproductive solutions are available today. Some may be less attractive than others, but all of them enable women and their partners to parent. However, with the exception of PGD, they do not permit couples to have a genetically related child, and this, it would appear, at least as far as the Nuffield report is concerned, is the most important thing. On one level, I can understand individuals wanting to have a healthy child that carries their genes; on another, I wonder how far we as a society are prepared to go to cater to such desires. Is this about parenting children or is it about replicating one's nuclear DNA? What is a family? Will the nuclear family of the 21st century be defined by DNA rather than social and economic ties?

PNT and MST: A step forward or a step too far?

In recommending that it would be ethical to develop PNT and MST as treatment options in the eradication of mitochondrial disease, the Nuffield Council has sanctioned germline therapy in humans for the first time. We may have only 37 mitochondrial genes (1.6), which act as "powerhouse[s]" or "batteries" (1.1), and there may, indeed, be a "material boundary" (4.65) (although not a Chinese wall) between nuclear and mitochondrial DNA, but by replacing mutated mitrochondria in a

Genomics, Society and Policy, Vol.8 No.2 (2012) ISSN: 1746-5354
© ESRC Genomics Network.

fertilised egg we will cross the genetic Rubicon. This may not be a slippery slope as such (4.65), but it could be a dodgy step, and when you tread on dodgy steps they may give way and sometimes things get broken. We cannot predict what may happen if these technologies are used in the future. All we can say is that using MST and PNT to produce disease-free genetically related children involves known risks for individuals (donors and recipients) and unknown risks for the species, and that developing this technology for clinical implementation will use many resources. Should we use our scarce resources to develop these technologies so that we can make genetically related children who are mutation free? Read the arguments outlined in the Nuffield Report and make up your own mind.

---

[1] PHG Foundation, Cambridge. nina.hallowell@phgfoundation.org

2 Collins N. 'Three parent baby' fertility technique could be made legal. Daily Telegraph 17th September 2012 http://www.telegraph.co.uk/science/science-news/9546214/Three-parent-baby-fertility-technique-could-be-made-legal.html. Accessed 10th December 2012

Genomics, Society and Policy, Vol.8 No.2 (2012) ISSN: 1746-5354
© ESRC Genomics Network.