

Mitochondrial Replacement Technologies

A STATEMENT BY THE NATIONAL COUNCIL OF CHURCHES IN SINGAPORE

On 3 February 2015, the British Parliament voted in favour of legalising a technique of mitochondrial replacement known as maternal spindle transfer (MST). The UK is the only country in the world to legalise this controversial method in assisted reproductive technology (ART).

The aim of this technique is to enable women with mitochondrial disease to have healthy children by preventing the transmission of disease-linked mitochondria to their offspring.

Mutations in the mitochondrial DNA (mtDNA) can cause serious and debilitating health problems such as blindness, deafness, neurodegenerative disease, muscular dystrophy, gastrointestinal encephalopathy and diabetes. In some cases, dysfunctional mtDNA could even lead to death. Mitochondrial disease affects 1 in 6,000 people.

MST requires a healthy donor egg, free from mitochondrial disease. The cell nucleus or the spindle of chromosomes is removed from the healthy, unfertilised egg. The nucleus cell of the intended mother (the woman who has mitochondrial disease) is then inserted into the healthy egg of the donor. The resulting 'combi-egg', which comprises the healthy mtDNA of the donor and the cell nucleus of the mother, is then fertilised in vitro by the sperm of the father.

Scientists think that this technique would prevent the child from inheriting its mother's defective mtDNA. The advantage of this technique is that the social parents could, in a qualified sense, also be the genetic parents of the child.

Mitochondrial replacement technologies, however, raise a number of profound theological, ethical and social issues.

Three Genetic Parents

The first theological and ethical concern is that this procedure would result in a child with three genetic parents.

MST highlights the status and significance of the gametes. Although the egg and the sperm by themselves are unable to give rise to life, they however each carry a code. When brought together, the two codes form what is called the code of life.

In MST, the genes of two women are mixed as the healthy mtDNA of the donor and the mother's spindle of chromosomes is placed together. Although the mtDNA provides less than 0.1% of the total genetic make-up of the newborn, the fact remains that the child has three genetic parents.

The fertilised egg carries one paternal code and two maternal codes. The resulting embryo therefore has one genetic father and two genetic mothers.

Needless to say, the intrusion of a third party in the process of procreation is a serious violation of the structure of the family that God has ordained.

Egg donation also raises the difficult issue of the relationship between the donor and the child-to-be, which has serious legal and social implications. This problem obtains even though MST uses only the mtDNA of the donor egg.

Concerns About Safety

The proponents of this technique have argued that MST is safe, downplaying the potential harm that it can bring to the baby. But, as other scientists and ethicists have rightly pointed out, it is difficult to ascertain the safety of the procedure. To do so would require considerable time and finance to properly investigate the possible short-term and long-term harm of mtDNA replacement.

It is also important to stress the experimental status of mitochondrial replacement technology. The fact is that scientists currently have very little information about both the efficacy and the safety of the technique.

Safety concerns must not be confined only to the child in question. Some scientists and ethicists have raised important questions about the safety and wellbeing of future children. This is because mitochondrial replacement technologies alter the germline.

In MST, the mtDNA of a third-party donor will be passed from women to their children. Female children will pass this donor mtDNA to their children, down the female line. The long-term consequences of this to the health and wellbeing of future generations simply cannot be known at this point in time.

There are also concerns about the safety of egg providers or donors. Drug-induced egg production and procurement is not only time consuming, inconvenient and painful. It can also be risky.

Routine hormonal treatment required of egg donors may cause serious physical discomforts like nausea, cramping, bloating, and mood changes. Other physical harms include organ damage, thromboembolism and ovarian, breast and colon cancer.

In addition, egg donation also raises concerns about the commodification and commercialisation of women's bodies.

While the current goal of mitochondrial replacement technology is 'therapeutic', the same technique could also be used for non-therapeutic purposes. Together with other forms of germ-line modification and intervention, this technology could also be used for the purpose of enhancement. The long-term consequences of such bold attempts to alter our 'genetic patrimony' by tampering with the human genome cannot be fully anticipated.

This is the reason for the international moratorium on techniques that would modify the germline irrespective of whether their goals are therapeutic or non-therapeutic.

Objectification of Children

Finally, there are concerns about how this and other assisted reproductive technologies have subtly but profoundly changed the way in which we understand procreation and children. In MST, the child-to-be is seen as an artefact, assembled together like a collage. The aggregate egg is constructed like brickwork and then fertilised in-vitro. The embryo is seen as the result of procedures, the product of *homo faber*.

Mitochondrial replacement technologies also sit uneasily with our understanding of conventional medicine. Here, the metaphor of healing associated with medicine is replaced with that of engineering associated with manufacture. By treating the child as a construct, such depersonalising technologies change our perception of procreation itself. And this in turn raises profound concerns about the objectification of children.

These considerations are not abstract because the way in which we view medicine, technology, procreation and children will shape our vision of society.

Conclusion

While the Council recognises the plight of women with mitochondrial disease, it cannot support the legalisation and application of mitochondrial replacement technologies because of the serious theological and ethical problems associated with them.