

Three parent families: advantages and disadvantages



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A controversial genetic treatment was approved in Britain and now the first baby with three genetic parents can be born in 2015. The process will allow that women affected by devastating hereditary diseases to have healthy children. However this procedure will open the window of DNA modification in humans – something that was long ago decided as unethical. Is this a real breakthrough treatment or crossing a dangerous boundary?

The procedure aims to prevent mitochondrial diseases, involving lack of energy, muscular dystrophy, blindness, brain disorders, heart failure and death in the most extreme cases. Defective mitochondria affect one in every 6500 babies and research suggests that the diseases can be prevented by using mitochondria from a donor egg. There are two possible methods: the embryo repair and the egg repair. In the embryo repair approach both eggs (mother's and donor's) are fertilised with sperm and the parents' pronuclei, which contain genetic information, is swapped with the donor's one and this final healthy embryo is implanted into the womb. The egg repair involves taking the nucleus of the egg with damaged mitochondria and inserting it into the cytoplasm of the donor's egg which has had the majority of the genetic material removed, but still contains healthy mitochondria. Then the resulting egg is fertilised by sperm.

As mitochondria have their own DNA, the resulting baby of this procedure would have DNA from two parents and a small amount from a third donor. This genetic modification raises major ethical concerns for a lot of people. According to consequentialism people should do what produces the greatest

amount of good consequences. It is known that with this procedure, these women would be able to have genetically related healthy children. However, is this consequence strong enough to justify the beginning of human genetic modifications? Which way leads to the greatest amount of good consequences?

Since it is an invasive manipulation of embryos there are risks associated. It is not possible to assure that new diseases would not come out of this treatment due to some relation between DNA of mitochondria with the nucleous DNA, for example. If the procedure is relatively new, not much information about long-term health effects are known. Therefore, no medical benefits would emerge for the child or the mother.

The mother would be able to have genetically related healthy children, which represents a social benefit to her, not a medical one. As the DNA swap takes place at the “germ line” the donor’s DNA would pass on to any future generations down the female line and not only to this first child. Thus, the treatment would represent a way of stopping the disease of being passed on to their future generations. Nevertheless, it would also be changing the genetic information of the family; that it will always have the donor’s DNA included. Would this have implications for future persons?

Opponents to this treatment claim that are other options that may be considered for these cases such as adoption or egg donation. Is adoption really an option? People that desire to have their own children usually do not see adoption as option. It will not be a good relationship between parents and child if the adopted child is seen as a second option and not a desired

one. Through egg donation parents are not genetically related to the child and this treatment would allow them to be.

Another of the major concerns related to this technique is that the next step would be fully altered genetic babies since the line of performing modifications in human DNA would be already crossed with this procedure. It has been described as a “slippery slope” for society that can lead to other forms of genetic modification.

There are several questions that need to be answered. Would the child have identity problems since it would have genes from three people? What would be the role of this “second mother”? Would she have the same status as other egg donors or could be considered a legal parent?

Apparently there was not enough debate about this topic. Usually, people get very afraid of these pioneer changes that can be one small step away from a worst case scenario. Moreover, it is easy for people to associate genetic modifications with stories described in novels or cinema, as dystopian societies are depicted several times. A dystopia ^[1, 2] is a place that is in some important way undesirable or frightening; it is the opposite of utopia. Dystopias are often characterized by dehumanization, totalitarian governments, environmental disaster, or other characteristics associated with a cataclysmic decline in society. Usually they appear to draw attention to real-world issues regarding society, politics, economics, environment, religion, psychology, ethics, and science and technology, which if unaddressed could potentially lead to such a dystopia-like condition. Two

examples that address to genetic modifications are *Brave New World* and *Gattaca*.

Brave New World ^[3], a novel that was also adapted to a movie, describes how developments in reproductive technology, combined with others, are responsible for profoundly changes in society. Natural reproduction is no longer done. Instead, children are produced in “hatcheries and conditioning centres” and divided into castes and designed to occupy predetermined positions in the social and economic life. There are five castes: “alpha” and “beta” are able to develop naturally but “gamma”, “delta” and “epsilon” are manufactured to have arrested development in intelligence or physical growth.

In the reality described in *Gattaca* ^[4] (the title is based on the first letters of guanine, adenine, thymine, and cytosine, the four nucleobases of DNA) children are conceived through genetic manipulation to guarantee they possess the best hereditary traits of their parents. The main character was conceived outside the program and fights to overcome genetic discrimination. Characters battle with society and themselves to find what their place in the world is and who they are destined to be according to their genes. This way, the movie is able to draw attention over reproductive technologies and the possible consequences of such technological developments for society.

By allowing this treatment, are we going towards a dystopian society like these ones described?

On the other hand, despite all the concerns that the treatment involves should the evolution of science be stopped? If it would be fully regulated and the consequences well studied, why should this treatment be stopped? Why should not these mothers be allowed to have access to this known treatment? Most people have the desire to have their DNA related children and this treatment seems the only option for these women, also stopping the disease of being passed on to their future generations.

Medical researchers defend that the debated modification does not affect fundamental DNA, the one that will determine individual's characteristics such as facial features or eye colour. Therefore what it is under discussion are not designed babies but a treatment of several diseases.

References

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3. *Brave New World*, <http://www.huxley.net/>
4. *Gattaca* (1997), <http://www.imdb.com/title/tt0119177/>