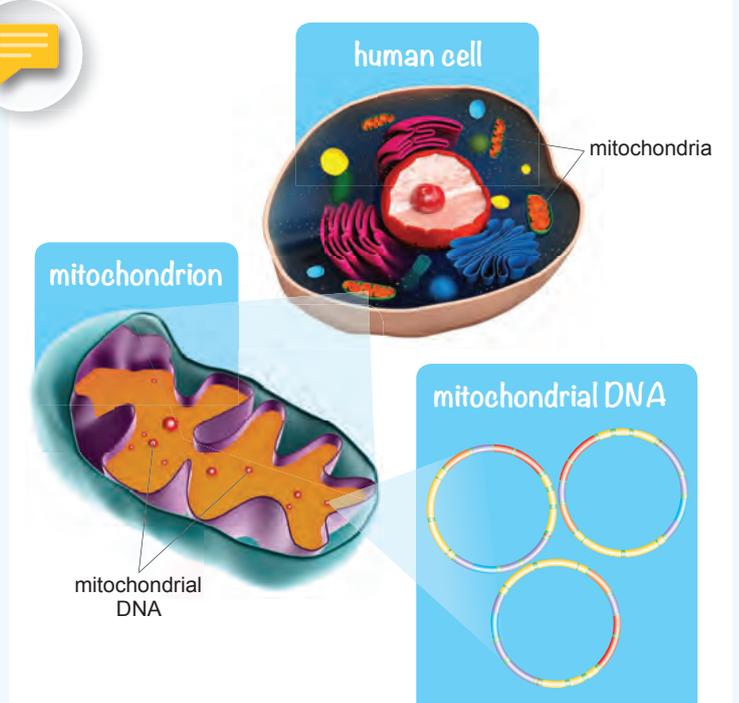


Three-Parent Babies



Imagine going into a local shop and selecting the genes you wanted your children to have by choosing from a menu or by pushing buttons on a vending machine. This is one of the reasons why people are concerned with the introduction of three-parent babies. They worry the technology will be used by the super wealthy to create perfect children by making their 'designer babies'. It could mean that sport's stars or famous actors, musicians and millionaires could sell their 'good' genes to people so that their offspring would be more successful in life. However, this is not what three-parent babies are about or what the technology that can create three-parent babies is for. They are a step towards **eradicating** some horrible **genetic disorders** that parents can pass onto their children.

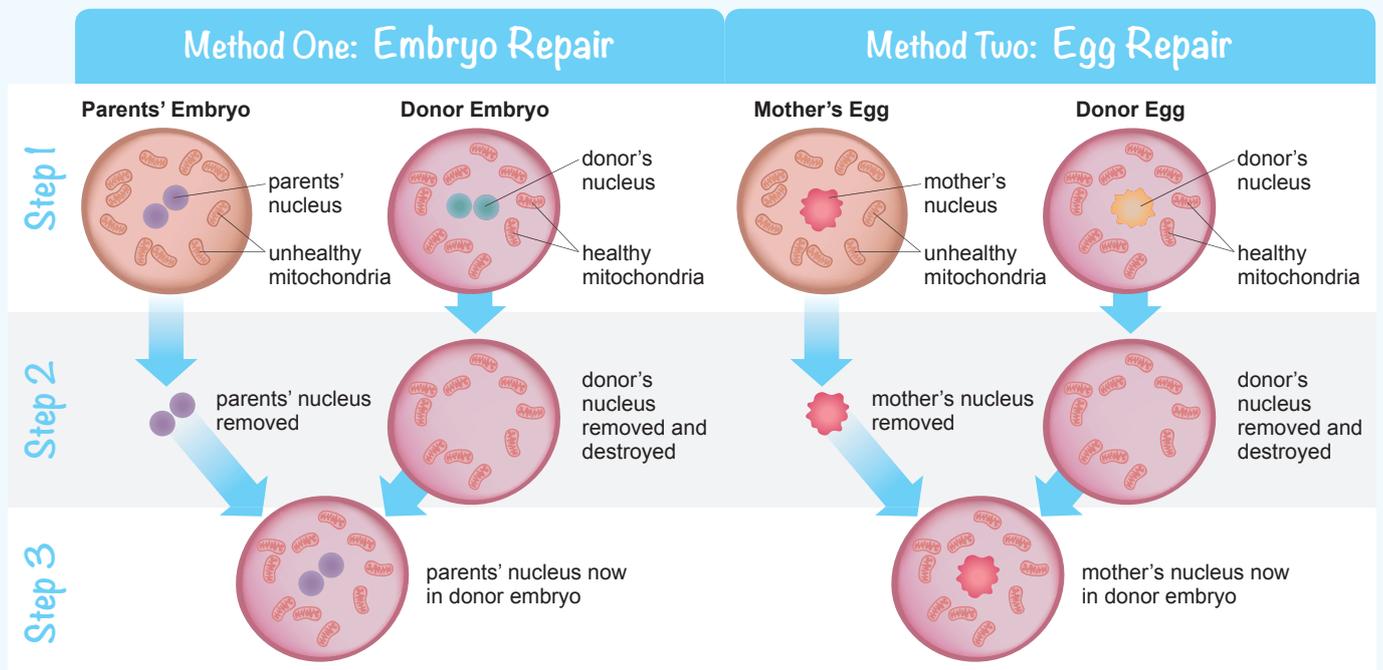


In your cells you have genetic material from both your parents that makes you the unique person that you are. Also in your cells is another type of genetic material called **mitochondrial DNA**.

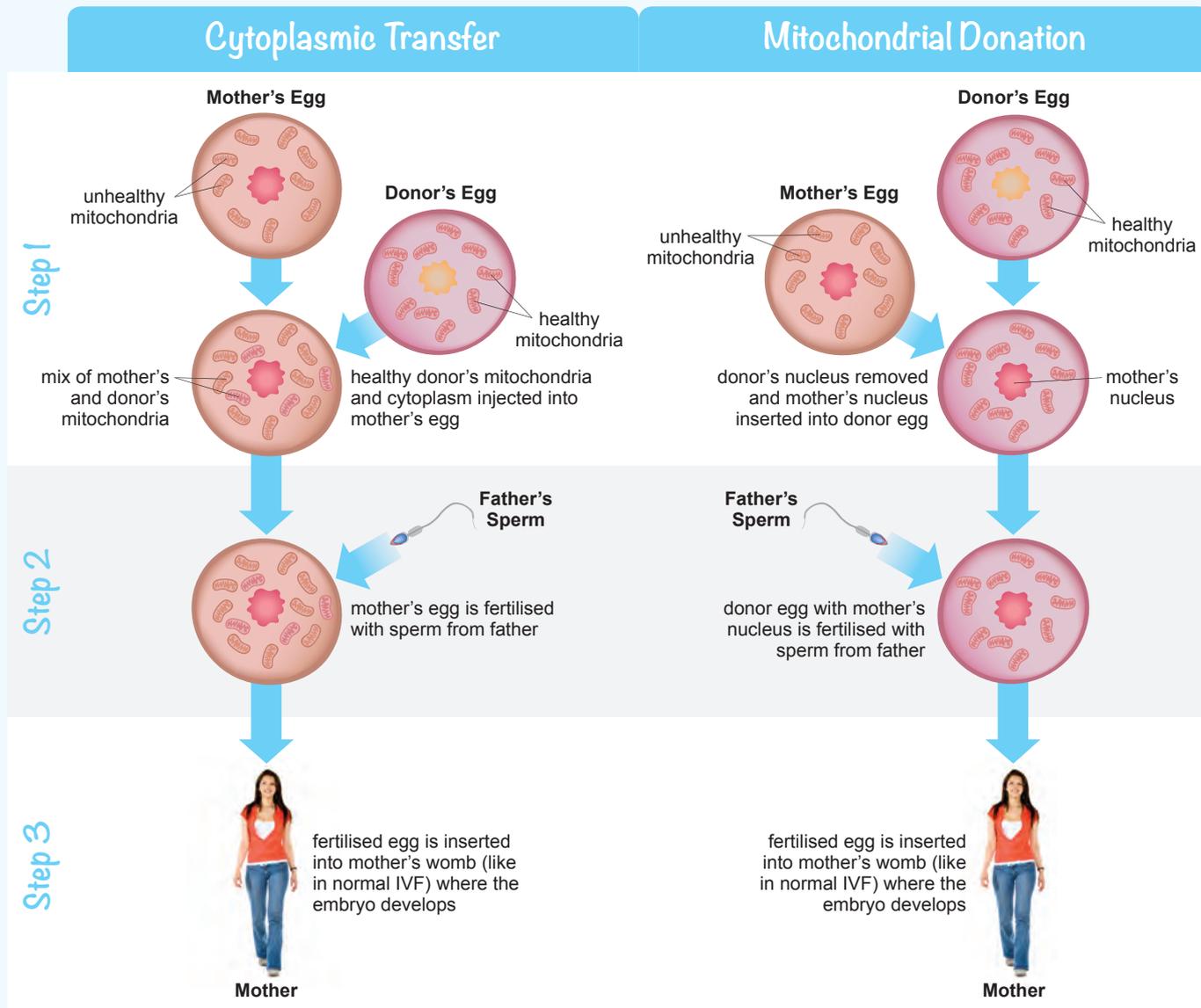
The mitochondria are a type of **organelle** inside your cells that are mainly responsible for producing energy that your cells can use. Each mitochondrion contains a piece of DNA that is composed of 37 different genes and are **inherited** solely from your female parent (and all female parents before that, e.g. maternal grandmother). They are part of the egg that combines with the sperm to form the **zygote**, which then becomes the baby. The genes in this type of DNA can cause some nasty genetic disorders that usually result in **miscarriage** or death of the baby soon after birth. They have also been linked to diabetes, cancers, heart disease, Alzheimer's disease, osteoporosis, Parkinson's disease, stroke and even aging. The mitochondrial DNA in some women is **defective** and carries these genetic disorders, and because it is always passed on, all that women's children would get the disorder and so in all likelihood die.

Three-parent babies is a technique designed to **eradicate** this problem. It is a process where the faulty mitochondrial DNA is removed and a donor's healthy mitochondrial DNA is used instead.

There are two main ways this can be done. The first involves removing the **nuclei** of the embryo shortly after fertilisation and putting them into a healthy embryo. The second involves modifying the egg before it is fertilised by putting the mother's egg's nucleus into a healthy donor egg. The child made does then have genes from three different parents. But the only way to have the genes from only two parents is by using donor eggs or embryos from a **maternal** relative (e.g. sister or aunty). However, this has an obvious drawback in that the diseases are passed down by the females. So if the woman trying to have a baby has defective mitochondrial DNA, then her female relatives are likely to have it too. This means **non-related** donors are preferred. The United Kingdom has passed a law that allows for this procedure to occur.



A similar process called **Cytoplasmic Transfer** was previously used in the USA but has since been banned. This process involved using the cytoplasm from a healthy cell (that contained unaffected mitochondria) but as it transferred larger amounts of material between people, it also allowed for other genetic material to become part of the offspring. Making the child produced have 1% of the third parent's genetic material. **Mitochondrial Donation** in comparison, only passes 0.1% of the third parent's genetic material onto the child.



There are a number of concerns with this process, as well as the previously mentioned danger of designer babies. These include:

- The human **embryos** that are being used for testing could have become a child.
- The embryo is being modified and we don't know the long-term effect that this will have on future generations as the procedure is too new.
- The effect on the child's emotional and psychological wellbeing. For example, they may not feel 'in-sync' with their parents and others may **discriminate** against them for being different.