

Questions, concerns about 'three-parent' baby

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Pregnancy test. Credit: public domain

The surprise announcement that a healthy baby boy [was born from a new technique mixing the DNA of two women and a man](#) raises as many questions—scientific and ethical—as it settles, experts said Wednesday.

What are the methods?

Mitochondria—inherited from the mother—are tiny structures in cells that convert food into energy and have their own DNA, separate from the trait-defining genome housed inside the cell's nucleus.

A handful of rare genetic diseases, some of them fatal, can be passed down through this auxiliary maternal DNA.

There are two main techniques involving three "parents" for avoiding faulty mitochondria.

One removes the healthy nuclear DNA from a fertilised egg produced by a couple seeking to have a child, and then inserts it into a fertilised donor egg stripped of its own nucleus.

The other engineers a swap between unfertilised eggs, placing the healthy nuclear DNA of the mother into a nucleus-free [donor egg](#) with normal mitochondria.

Only then is the recomposed egg fertilised by sperm via in-vitro fertilisation.

Which methods work best?

"The pronuclear technique is somewhat more efficient at producing viable embryos," said David Clancy, a researcher in the faculty of health and medicine at Lancaster University in Britain, referring to the one using fertilized eggs.

"But the spindle method"—which yielded the "three-parent" baby introduced to the world on Tuesday—"transmits less of the maternal, and potentially diseased, mitochondria," he told AFP.

It also avoids the destruction of fertilised eggs, which some people find morally objectionable.

Both methods have been approved in principle in Britain, the only country with a regulatory framework for their use.

British health authorities, however, are still evaluating safety reports, and have not yet authorised clinics to perform the procedures.

That review process will likely conclude within a few months, according to the Human Fertilisation and Embryology Authority.

What don't we know?

Many scientists criticised the lack of data provided by John Zhang of New York University, who oversaw the mitochondrial swap.

Beyond a summary description, there was no scientific paper, and no raw data for other experts to pour over.

"The abstract gives very little information about the technique used, the follow up or the child, or the ethical approval process," said Doug Turnbull, a professor at Newcastle University in northern England and head of a specialised clinic for mitochondrial disease.

One key question is exactly how much of the mitochondrial DNA from the mother—which carried Leigh syndrome, a deadly neurological disorder—carried over into her son.

Zhang put the estimate at about one percent, but the evidence presented was found wanting.

"From the brief report, it is not clear what the levels of diseased mtDNA (mitochondrial DNA) are in the various tissues of the offspring," said Clancy.

Was the procedure ethical?

Many scientists hailed the announcement as a medical breakthrough.

"This is an ice breaker," said Dusko Illic, a researcher in stem cell science at King's College London.

"Hopefully this will tame the more zealous critics and accelerate the field."

But other experts raised red flags.

Moving the operation to Mexico to avoid restrictions in the United States "is a concern," said Bert Smeets, director of the Genome Centre in Maastricht University in the Netherlands.

A [regulatory framework](#) "not only safeguards the introduction into the clinic, but also the follow up of the children born after treatment," he said.

Even Illic cautioned that the precedent "risks encouraging others to follow the example, as we saw with 'stem cell tourism'."

For Marcy Darnovsky, executive director of the Center for Genetics and Society, this "rogue experiment" was an irresponsible act.

"No researcher or doctor has the right to flout agreed-upon rules and make up their own," she said in a statement.

"This development is particularly troubling at a time when we are seeing fraudulent stem cell clinics by the hundreds putting patients at risk."

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