**Scientists genetically modify human embryos in controversial world first**

New procedure used to modify disease-causing gene, but raises questions over whether restrictions should be placed on new wave of genetic techniques [**Ian Sample**](http://www.theguardian.com/profile/iansample)**, science editor**

Scientists in China have genetically modified human embryos in a world first that has re-ignited the debate over the ethics and safety of genetic therapies that have the potential to prevent inherited diseases.

The work raises fresh questions over whether restrictions should be placed on a new wave of genetic techniques that are rapidly gaining ground in labs across the world.

The Chinese group used a genome editing procedure called Crispr to modify an aberrant gene that causes beta-thalassaemia, a life-threatening blood disorder, in faulty IVF embryos obtained from local fertility clinics.

The embryos used for their experiments were abnormal and incapable of developing into healthy babies and would have been destroyed by the clinics. They were not implanted into women once the modifications were made.

The team, led by Junjiu Huang at Sun Yat-sen University in Guangzhou, is the first to publish such work, confirming rumours that have been circulating for months that human embryos had been modifed in China. The work is described in the journal [Protein and Cell](http://link.springer.com/article/10.1007/s13238-015-0153-5/fulltext.html).

Two prominent journals, Nature and Science, rejected the paper citing ethical objections, Huang said.

Many scientists believe that genetically modifying human embryos crosses an ethical line and should remain taboo. But the capability is becoming ever more likely. Scientists have recently developed a host of genome editing procedures. And while they are incredibly powerful and simple to use, how safe they are, and how they should be used, is not yet clear.

Last month, researchers writing in Nature called for a [global moratorium](http://www.nature.com/news/don-t-edit-the-human-germ-line-1.17111) on the genetic modification of human embryos, citing “grave concerns” over the ethics and safety. They added that any therapeutic benefits were tenuous. Genetic modification of the DNA in human embryos would not only affect the individual but their children and their children’s children and so on down the generations. Advocates argue that could halt the inheritance of genetic diseases that run in families, but it could also pass on unforeseen medical problems that the procedures may cause.

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The Chinese team attempted to correct the faulty gene that causes beta-thalassaemia in 86 human embryos. The procedure worked properly in only a tiny portion of those tested. “If you want to do it in normal embryos, you need to be close to 100%,” [Huang told the journal Nature](http://www.nature.com/news/chinese-scientists-genetically-modify-human-embryos-1.17378). “That’s why we stopped. We still think it’s too immature.”

One of the main safety concerns with genome editing is the risk of changes being made to healthy genes by accident. These so-called “off-target” edits happened far more than expected in Huang’s study, suggesting that the procedure they used is far from safe.

“What the paper really emphasises is that we are far away from using genomic editing because it’s not safe. The idea of using this for designer babies is very far-fetched. The technology is too far off,” said Dusko Ilic, a stem cell researcher at King’s College, London.

But Ilic said that research on genome editing, and its potential uses in humans, would continue unabated. “You cannot stop science. No matter what moratorium is proposed, you cannot stop this work continuing around the world,” he said.

He added that the Chinese work was not unethical. “These embryos had been fertilised by two sperm. They would have been discarded by any IVF clinic in any country in the world. There is no ethical objection you can bring.”

Doctors at IVF clinics can already test embryos for genetic diseases and pick the healthiest ones to implant into women. If genome editing was safe and effective, it could potentially be used to correct genetic faults in embryos instead of picking those that happen to be healthy. Currently, under UK law, genetically modified embryos cannot be transferred to women.

One UK geneticist who did not wish to be named because the work was so contentious, told the Guardian that the Chinese study had long been expected : “It was clear to everyone that these techniques were going to work in humans and that it would be done at some point,” they said. “It’s a bit sensationalist.”

“You can argue that it could be hugely beneficial to correct genetic diseases, but on the other hand we don’t know it’s safe and it’s a slippery slope. How long will it be before people try to alter eye and hair colour, and height and intelligence?”

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