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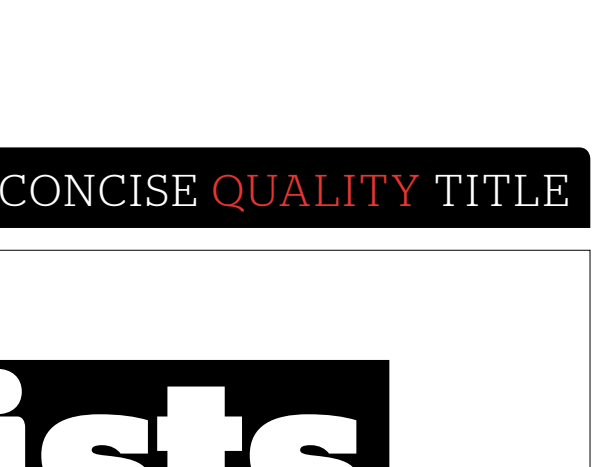
i exclusive

Scientists call for rules on designer babies

» New age of genetically modified children needs global regulation, warn top academics, after major breakthrough in 'editing' human embryos

» Concern that maverick doctors will create world's first GM baby



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COVER STORY

Scientists call for new rules on GM designer babies

By Tom Bawden
SCIENCE CORRESPONDENT

New rules will need to be introduced to regulate genetically modified "designer" babies if a breakthrough in gene editing is to be exploited in the UK, an expert in ethics has said.

Professor Jonathan Montgomery, one of the UK's leading health law academics, was speaking after **i** revealed that US scientists have for the first time convincingly shown how inherited diseases caused by defective genes could be corrected in the earliest stage of life.

The new human embryo gene-editing technique has the potential to bring about huge improvements in eradicating inherited medical conditions.

However, he also warned that it could pave the way for unscrupulous surgeons in countries such as China and Mexico to set up unregulated clinics to offer desperate would-be parents dangerous or over-ambitious procedures that will fail or leave the "designer baby" with lifelong defects.

And he said that while regulations in the UK are currently robust, new rules would need to be introduced if the human embryo gene-editing procedure was going to be used clinically, rather than just for research purposes.

The new technique involves a revolutionary gene-editing techology known as Crispr-Cas9, which has been likened to the "find and replace" command of word-processing software and is relatively cheap and easy to carry out.

But while scientists hailed the development as a medical breakthrough, they said it also raised ethical concerns.

"This development raises exciting scientific possibilities but the ethical implications need to be carefully considered," said Professor Montgomery, of the University of London, who was also chairman of the internationally renowned Nuffield Council on Bioethics until February this year.

"Because the technique is apparently not difficult, it could quickly become usable by people outside the magic circle of highly expert people. So instead of being done in top-quality scientific labs, it could be done by a wide range of people who are outside the usual canon of regulation," he told **i**.

If the technique is proven to be successful enough to be allowed as a clinical procedure, there will also have to be thought given to the ethics of gene editing.

While genetic modifications to prevent babies being born with inherited disabilities is likely to gain widespread support, there will also be questions about whether it can be used to guarantee attributes such as muscularity, hair colour or perhaps even the level of intelligence.

{i} Scientists in the UK wanting to experiment with gene editing of embryos need a licence to do so. It is thought that **only the Francis Crick Institute in London has been granted a licence so far**.

REACTION

Huge potential to eliminate disease – but complex ethics

By Tom Bawden
SCIENCE CORRESPONDENT

Scientists in laboratories across the UK and the rest of the world were gripped yesterday by i's revelation that a breakthrough had been achieved towards creating genetically modified babies.

They welcomed the reports of the success of the new gene editing technique and said that if maintained in future tests it could make a huge difference to people who want to have babies without passing on debilitating medical conditions.

"It is really important, although it was just a matter of time," said professor Joyce Harper, of University College London (UCL). "The medical implications are quite straight forward, but ethically, things are a lot more complicated."

Prof Shirley Hodgson, of St George's, University of London, said: "This is clearly an interesting media report.

"So far from previous research done in China it has been a technique with significant errors. The media reports suggest that in the experiments cited, these errors have been minimised, but clearly as well as needing confirmation in a published scientific paper this requires substantial further experimentation to confirm this is actually the case."

"The technology to support research into correcting diseases is readily available

How i broke the story about the developments in gene editing on yesterday's front page

Dr Simon Waddington, another UCL academic, said: "If what has been reported in the media is backed up by a paper published in a peer-reviewed journal, it would be a valuable increment, but we still have a long way to go. We are currently still in the foothills of understanding the full functions of lots of genes."

Dr Helen O'Neill, also from UCL, said talk of designer babies was a distraction from the fundamental aim of gene editing: "Unfortunately, the news about the potential ability to correct disease has been eclipsed by the fear of so-called designer babies," she said.

"The technology to support research into correcting diseases is readily available and is largely limited only by legislative barriers."

CULTURE

The 1997 film 'Gattaca' offers a warning about the dangers of genetic selection in humans GETTY

When real life echoes science fiction: is this our 'brave new world'?

By Adam Sherwin
ARTS AND MEDIA CORRESPONDENT

Has Aldous Huxley's "brave new world" finally arrived? The writer's nightmare vision of designer babies bred in test tubes has influenced popular culture's perception of genetic engineering for decades.

Published in 1932, *Brave New World* envisaged a population hatched from numbered test tubes and divided into five tiers of intelligence, through the chemical treatment of the embryos.

Developments in reproductive technology allowed a pre-ordained caste system to develop, separating an intelligent, managerial class from the lowliest group of menial workers. When the first so-called "test-tube baby", Louise Brown, was born in 1978, *Newsweek* headlined the event "Brave new world".

Analysis

The genie is out of the bottle – posing questions for humanity

Steve Connor

The key issue now is whether this powerful technology will ever be used to create a genetically modified baby. Even more important is whether the real-life application of Crispr-Cas9 on viable IVF embryos can be properly controlled and regulated – or whether it will be misappropriated by unscrupulous IVF clinics operating in countries where no such regulations exist.

The work of Shoukhrat Mitalipov and colleagues suggests that the safety concerns can be overcome, although much needs to be done to validate this in a clinical setting. But it now appears increasingly certain that Crispr-Cas9 will be safe enough for human germline genetic engineering.

The argument will then rest on whether its use is justifiable. To eradicate a serious inherited disease from an affected family? Most people would say "yes".

But genetic enhancements? If Crispr-Cas9 is used routinely and safely for one purpose, why not for another, if parents so wish? To resolve this requires a grown-up, open debate, not least about defining "genetic enhancement".

We mustn't lose sight of what is needed: an international agreement to control this gene-editing technology. It is no good regulating in one country if a maverick doctor can go off and use it in another. And that could easily happen now that details of how to apply Crispr-Cas9 to human IVF embryos are being openly published. The Crispr "genie" is out of the bottle.