Genetically engineered athletes could be heading this way soon

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How long before we start designing our future athletes from scratch – before they are even born?

A team from China grabbed the headlines last month when it announced it had edited DNA in the nucleus of human embryos. Whatever the ethics of such research, the breakthrough raises the question of just how far we will take tampering with our genetic make-up?

The Chinese team's work was done using a gene-editing technique called CRISPR (pronounced "crisper") and the results were not spectacular –

only four of the 86 eggs injected were successfully modified.

Nonetheless, Harvard Professor George Church believes that within five to seven years it will be possible to snip out and replace stretches of DNA to genetically engineer babies.

But should this kind of research be done at all? And as parents look to guarantee a better future for their children, what should we consider acceptable?

Designer babies

In 1988, doctors at the Hammersmith Hospital in London pioneered a procedure known as pre-implantation genetic diagnosis (PGD), which would enable doctors to "design" a baby that did not carry the genes for some inherited conditions.

PGD begins with in-vitro fertilisation (IVF) and allows parents to have embryos tested to ensure they don't have a faulty gene before being implanted in the mother.

Since the birth of the first PGD baby in 1988, there have been more than 12,000 babies born by this technique. The use of PGD is expected to accelerate in the foreseeable future, with predictions that it will one day be used as regularly as amniocentesis, another pre-natal test routinely used to check for fetal abnormalities.

The idea that couples once spent months, or even years, trying to conceive, and then months more hoping that everything would be okay, might one day seem the quaint, almost backwards, practice of a primitive culture.

Designer athletes

Selecting embryos with particular genes affords parents profound and unprecedented decision-making capabilities regarding the genetic make-up of their children. Will this technique soon be used not only to avoid passing on undesired genes, but to design children with specific traits – including desired athletic abilities?

This is not science fiction. Parents are already using PGD to choose the sex of their unborn child. In 2009, an American clinic went a step further and announced it would offer a new service allowing couples to select some physical traits of their babies (this offer was later withdrawn).

The personal genomics and biotechnology company 23andMe is also ready to contribute to the designer baby process with its Family Traits: Inheritance Calculator.

In September 2013, the company was granted a patent for a product that allows would-be parents:

[…] to select a donor and view other possible phenotypes of the hypothetical child resulting from the recipient's and the donor's gametes, such as alcohol flush reaction, lactose tolerance, muscle performance, and any other appropriate phenotype.

There is also the possibility to make a direct request along the lines of:

[…] which donors in this database, were their genetic material combined with mine, would be most likely to yield a child who will be taller and run faster than its parents?

The company was quick to disavow any plans to actually offer donor

gamete selection, and sought to reassure critics that its calculator offered only:

[…] an engaging way […] to see what kind of traits your child might inherit from you.

So maybe we're not quite at the stage where would-be parents sit in front of a catalogue and design their own baby via a list of desired attributes. But it is easy to imagine such a catalogue in the not-too-distant future. Intelligence and health will probably be on the front page, beauty on page 3, and sporting ability at the back.

A fundamental drawback with all of these techniques is that genes can only be selected from those present in the donated eggs and sperm. Current limitations to the number of embryos that can be produced and tested in a single IVF-PGD procedure will also restrict the number of traits that parents can select in a single embryo.

These constraints will probably drive the demand for gene therapy. If gene therapy lives up to its promise, parents will be able to go beyond selecting desirable athletic traits to inserting any number of genes they do want into their embryos, and possibly also gametes (egg and sperm).

Again, this is not science fiction. As described above, the blueprints for such techniques have already been developed. But taking this research to the next level will be controversial.

Limits on research

Back in March, some of the world's leading genetic scientists published a commentary in Nature calling for a moratorium on gene editing research in cells that can form human embryos.

But not everyone is against the idea of editing the human genome. James Watson, the American biologist who shook the world in 1953 when he co-discovered the "molecule of life" with Britain's Francis Crick, has backed genetic manipulation to make people more intelligent and better-looking.

A 2009 study by the New York University School of Medicine reported that 10% of parents surveyed would approve of genetic testing to ensure their child was athletic.

Five years later, a survey of 1,001 Americans reported that 26% felt it would be a good thing if "prospective parents can alter the DNA of their children to produce smarter, healthier, or more athletic offspring".

Of course, there are still many hurdles to be overcome before fantasy sport babies become a reality. Despite 30 years of research, we still know very little about which genes contribute to sporting success (although researchers, including those at Victoria University, are currently working on this).

There are also many technical, safety and legal concerns that need to be resolved before gene testing and gene selection are likely to become available for parents wishing to produce more athletic offspring.

History tells us, though, that national borders, high costs, uncertain outcomes and country-specific legislation will not stop some parents from seeking to grant their own reproductive wishes.

Now is the time to start the conversation, and to ask whether we really want a future in which we expand the heavily-managed, high-pressure, child-rearing practices we commonly accept to embryo selection, and ultimately start inserting sports genes to create talented sports children. Do we really want to add CRISPR athletes to the sporting menu?