Scientists unveil plan to create synthetic human genomes

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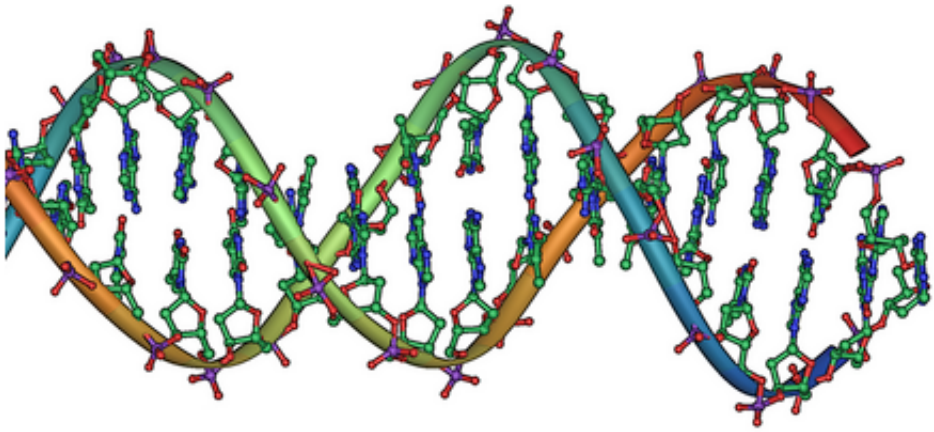

DNA double helix. Credit: public domain

A group of American-led scientists and entrepreneurs has announced the start of a 10-year project aimed at creating synthetic human genomes in a move that could revolutionize the field of biotechnology but raises troubling ethical concerns.

The ambitious proposal could make it possible to grow human organs for transplant and speed up the development of vaccines, the project backers said in a paper published Thursday in the journal *Science*.

But the idea has already sparked criticism due to the potential of one day creating children with no biological parents, and due to the secrecy surrounding a recent closed-door meeting on the subject.

Its proponents envision a project on the same scale as the Human Genome Project, which mapped and published the full, sequenced human genome in 2003—or the 99.9 percent that we all have in common.

Dubbed "Human Genome Project-write" or "HGP-write"—since synthesizing would amount to "writing" rather than "reading" our genetic code—the project aims to reduce the cost of engineering DNA segments in the lab.

The new goal would be "more ambitious and more focused on understanding the practical applications than the original Human Genome Project," said George Church, a genetics professor at Harvard Medical School, and one of the 25 authors of the paper.

$100 million

The project's backers said they hoped to launch it this year after raising $100 million around the world from public, private, philanthropic and academic sources.

They did not provide an estimate for total costs, saying only that it would likely be less than the $3 billion for the Human Genome Project.

The genome is the genetic blueprint of every organism—the complete set of DNA containing the instructions it needs to survive and thrive.

Sequencing the human genome requires decoding the exact order of about three billion base pairs of DNA packed into 30,000 genes.

"Genome synthesis is a logical extension of the genetic engineering tools that have been used safely within the biotech industry for ~40 years and have provided important societal benefits," the paper's authors said.

Potential applications, they said, include "growing transplantable human organs and engineering immunity to viruses in cell lines via genome-wide recoding."

Other potential benefits include "engineering cancer resistance into new therapeutic cell lines and accelerating high-productivity, cost-efficient vaccine and pharmaceutical development using human cells and organoids," they added.

Public debate

In response to ethical concerns, the project's promoters said they envisioned a broad public discourse with "conversations well in advance of project implementation."

Thursday's publication followed an invitation-only meeting of 130 scientists, policymakers and entrepreneurs at Harvard University three weeks ago that was shrouded in secrecy.

The New York Times cited organizers as saying that they wanted to avoid publicity so as to not jeopardize publication of the project in a peer reviewed scientific journal.

Critics of the idea include Drew Endy, a bioengineer at Stanford University, and Laurie Zoloth, a professor of religion at Northwestern University.

"Taking a step back, just because something becomes possible, how should we approach determining if it is ethical to pursue?" they wrote in

a recent op-end article for Cosmos magazine.

"Discussions to synthesize, for the first time, a human genome should not occur in closed rooms."

Commenting on the project, synthetic biology professor John Ward of University College London said: "The project is not as controversial as some observers might be saying.

"First we already replace segments of human genes in cells growing in culture dishes. This is well regulated and is the very core of the new advances in medical genetics. Making large and larger pieces of human chromosomes and putting them into host cells in culture dishes will enable more deeper understanding of what all the genes and the non-coding DNA actually does," he said via the Science Media Center.

"There is no call to make an entire human being just as there is no push for doing that with current studies using human embryos."

More information: "The Genome Project–Write," *Science*, DOI: 10.1126/science.aaf6850