UNESCO

Gene-Editing the Next Generation: Establishing Global Guidelines for CRISPR Use in Human Embryos

With recent advances in China, the U.S. and the UK,
where does science end and ethics begin?

I. Introduction: A New Era Between Cure & Control

In November 2018, the world's understanding of science and ethics shifted overnight. A Chinese scientist named He Jiankui stood before a room of stunned researchers and announced the birth of twin girls, Lulu and Nana. These babies, he revealed, were the first humans to be born with edited genomes.

He had used a gene-editing tool called CRISPR to make them resistant to HIV. But what he saw as a medical breakthrough, much of the scientific world saw as a reckless violation. He had bypassed international norms, misled participants, and made permanent changes to human DNA that would be passed on to future generations. He was sentenced to prison - but the debate he started was just beginning. This wasn't science fiction anymore. Human germline editing - the ability to alter the DNA of an embryo - had arrived.

Supporters saw promise: a future without inherited diseases like cystic fibrosis, sickle cell anemia, or Huntington's. But critics warned of danger: a slippery slope toward genetic enhancement, designer babies, and new forms of inequality. For every hopeful parent who dreamed of preventing suffering, there was another who feared a future shaped by market-driven eugenics.

And so the world paused. Not because we lacked the technology, but because we lacked the rules, and perhaps the wisdom, to use it.

This is where your committee begins: in the space between what is possible and what should be permissible. As CRISPR develops rapidly in labs across China, the United States, and the United Kingdom, the global community is being forced to answer a question once left to fiction:
Should we redesign the future of humanity? And if so, who gets to decide what kind of future it should be?

II. What Is Germline Gene Editing? (And Why It's Different)

CRISPR may sound like something out of a sci-fi novel, but at its core, it's a remarkably precise tool that allows scientists to edit DNA. Imagine a pair of molecular scissors guided by GPS: CRISPR-Cas9 can locate a specific gene in an organism's DNA and cut it. Once cut, the cell either disables the gene or replaces it with a new version.

Gene editing in itself isn't new. What makes germline gene editing so radically different is where it happens - in embryos, sperm, or egg cells. This means the changes aren't just for the individual. They are heritable: they pass down through generations.

This simple shift changes everything. If a person with a genetic condition undergoes somatic gene therapy (which only affects their body cells), they may be cured - but their children still inherit the original risk. With germline editing, that same condition could be eliminated from a family line forever. It's prevention, not treatment.

But with that power comes unprecedented complexity. Because when we change the germline, we are making decisions for people who don't yet exist, altering lives that have no voice in the process. The edits, successful or not, could ripple across generations in ways we don't yet fully understand.

Different camps are forming:

- Medical advocates say that if we can safely eliminate terrible diseases, we are morally obligated to do so. Why would we accept suffering we can prevent?
- Cautious ethicists argue that the science is not ready, and the social consequences are even less predictable. What if editing one gene leads to problems elsewhere? What if embryos are edited to meet social preferences rather than health needs?
- Cultural and philosophical voices question the idea of editing life at all. Some traditions view the human genome as sacred or untouchable. Others worry that what starts as healing will quickly become enhancement: altering height, intelligence, or even personality traits to fit shifting ideas of "normal" or "desirable."

And then there's the most difficult question of all: Who gets to decide? Unlike medicine, which responds to illness, germline editing involves making permanent, proactive changes to future people. The stakes are not just medical: they're political, ethical, and deeply human.

This is not simply about curing disease. It's about defining the future, and who is included in it.

III. Competing Worldviews: Is It Science, Ethics, or Politics?

The debate over germline gene editing isn't just about whether the science is safe; it's about how different societies understand life, power, and responsibility. Below are four key worldviews that often clash in this global conversation:

A. The Scientific Worldview: Innovation as Progress

To many scientists and medical researchers, CRISPR represents a revolutionary step forward in human health. If we can correct the DNA mutations that cause hereditary diseases, such as Tay-Sachs, cystic fibrosis, or Duchenne muscular dystrophy, why would we choose not to? This view emphasizes evidence-based progress (decisions should be driven by data and outcomes, not fear), humanitarian potential (reducing suffering through technology is a moral good) and regulated innovation (with strong oversight, it is possible to move forward responsibly). For these advocates, inaction is not neutral - it is a choice that prolongs suffering. The focus is not on perfection or enhancement, but on healing. However, even within this camp, there is division. Some scientists worry that pressure to rush ahead (for funding, recognition, or political influence) could outpace safety or ethics. And most agree that public trust must be earned, not assumed.

B. The Ethical Worldview: Caution Before Consequence

From a bioethical standpoint, the debate centers on the limits of power. Germline editing isn't just a medical procedure; it's an intervention with irreversible effects on people who cannot consent: future children. Key ethical concerns include informed consent (how can unborn individuals consent to permanent biological changes?), unintended consequences (editing one gene may affect others, leading to new health problems) and a slippery slope to enhancement (once editing for disease is allowed, what stops us from editing for intelligence, appearance, or even personality?). This worldview calls for global frameworks, not isolated national experiments. It emphasizes inclusion of public voices, especially from groups historically excluded from science policy, such as disabled people, Indigenous communities, and people in the Global South. For bioethicists, caution is not anti-science. It's a call for humility in the face of complexity.

C. The Religious & Cultural Worldviews: Sacred Boundaries

Across cultures and religions, views on gene editing vary widely, but many share the belief that human life is not entirely ours to modify.

- In Catholic ethics, life is considered sacred from conception, and altering the embryo is seen as violating the dignity of creation.
- In Islamic bioethics, there is debate: while healing is encouraged, editing heritable traits raises theological concerns about tampering with God's design.
- Some Hindu philosophies accept reincarnation and karmic cycles, but differ on whether intervening in those cycles through gene editing is a spiritual overstep.
- Indigenous belief systems often emphasize balance with nature and community over control or individual enhancement.

Importantly, not all religious thinkers oppose gene editing. Some argue that using knowledge to heal is aligned with divine purpose, but still urge that such power be exercised with deep moral restraint. These worldviews remind delegates that science does not exist in a vacuum. Cultural context matters, and global guidelines must respect moral pluralism.

D. The Political Worldview: Power, Access, and Inequality

For many policymakers, economists, and social justice advocates, the question isn't just whether we should gene-edit - it's who gets to decide, who gets access, and who bears the risks. Concerns include inequality (will only wealthy families be able to afford gene editing for their children?), genetic elitism (will certain traits be favored over others, reinforcing racism, ableism, or classism?), CRISPR tourism (what happens if parents travel to countries with weaker regulations to pursue risky procedures?) and eugenics revisited (how do we avoid repeating historical abuses under new scientific language?). Some critics argue that science policy is often dominated by rich nations, with little input from marginalized communities. Others warn that corporate interests may push gene editing forward for profit, not public good. This worldview insists that gene editing must be governed democratically, with representation from diverse backgrounds and transparency about who benefits, and who might be harmed.

Together, these perspectives form a complex puzzle. No single worldview holds all the answers, but none can be ignored. The challenge is not to choose one over the others, but to understand their tensions, and find a way forward that is both technologically responsible and morally inclusive.

IV. The Global Landscape: Where Are We Now?

Germline gene editing is no longer theoretical. Across the world, countries are taking strikingly different approaches to regulating, or accelerating, this science. These choices are shaped by political systems, economic ambitions, cultural norms, and ethical traditions. Understanding these differences is key to imagining what a global framework could (or could not) look like.

🇨🇳 *China: Ambition Meets Backlash*

China made global headlines in 2018 when He Jiankui announced that twin girls had been born with edited genomes - the first humans altered with CRISPR before birth. His stated goal was to protect them from HIV, but the reaction was swift and almost universally negative. He was imprisoned for violating medical regulations, but the case exposed a larger issue: China's push for scientific leadership outpaced its regulatory readiness.

The country has since revised its bioethics guidelines and increased oversight of genome editing research. But international observers remain cautious. In a system where science is closely tied to national pride and political authority, how much independence do regulators really have? How transparent are decisions when academic achievement is tied to global status?

Yet despite the scandal, China continues to invest heavily in biotechnology. Its scientists are advancing CRISPR-based therapies at a rapid pace. Some argue this is necessary leadership. Others fear it sets a precedent for quiet experimentation in the name of progress.

🇬🇧 *United Kingdom: Regulate, Then Research*

The UK takes a different approach: science with constraints. Through the Human Fertilisation and Embryology Authority (HFEA), the UK allows gene editing of human embryos for research purposes, but only under strict conditions. Embryos cannot be implanted or developed beyond 14 days, and all research must be licensed, reviewed, and monitored.

This structure has made the UK a leader in foundational CRISPR research. British scientists were among the first to edit human embryos to study early development, publishing their results openly. What makes the UK model stand out is its transparency and public engagement. Bioethical debates are encouraged. Regulators are clear about their standards. Critics and advocates alike know the rules.

Still, the 14-day rule is under pressure. Some researchers argue that scientific knowledge could be significantly advanced by extending the window. But who decides when it's time to shift that boundary? And how do you maintain public trust if the rules keep changing?

🇺🇸 *United States: Scientific Leadership, Fragmented Oversight*

In the U.S., CRISPR was co-discovered and developed into a Nobel-winning tool, and the country remains a hub for biotech innovation. But when it comes to germline gene editing, its policy landscape is chaotic. There is no federal law banning germline editing, yet federal funding for it is prohibited through restrictions placed on the Food and Drug Administration (FDA). As a result, embryo editing is effectively blocked in publicly funded research but not illegal in privately funded contexts. This patchwork approach creates a confusing regulatory climate: universities often set their own ethics standards, private labs may push boundaries, and political debates focus more on abortion and reproductive rights than gene editing itself.

Public opinion is polarized. Some Americans embrace CRISPR as an expression of personal freedom: the right to prevent illness in your children. Others fear it will become a luxury available only to the rich, reinforcing systemic inequality. Historical memory also plays a role: eugenics programs in the 20th century, once state-sponsored in the U.S., cast a long and painful shadow.

🌍 *The Global South: Excluded, Cautious, and At Risk*

In many countries across Africa, Latin America, and parts of Asia, the conversation around germline editing is less visible, but no less important. Most countries in the Global South do not yet have specific regulations for CRISPR in embryos. In some places, even basic bioethics infrastructure is limited. This creates two risks: being excluded from the decision-making tables where global norms are discussed, and being targeted by “CRISPR tourism” (the movement of wealthy clients to countries with weak enforcement).

But there’s also resistance. Many local scholars and activists argue that gene editing represents a form of biocolonialism: a continuation of centuries-long patterns in which Western institutions define the future, while others are left to absorb the consequences. There are also cultural and spiritual concerns. In many Indigenous and rural communities, ideas about health, disability, and reproduction differ from Western biomedical models. If CRISPR becomes a global norm, whose values will it reflect?

Some bioethicists from the Global South are now calling not just for inclusion, but for leadership, demanding that local communities shape the ethical frameworks around human genome editing, rather than merely reacting to them.

V. Questions To Consider

1. Disease vs. Enhancement

It seems simple: no one wants children to suffer from preventable diseases. But once you allow edits to remove illness, the line between therapy and enhancement blurs quickly. Is editing out a disease different from improving memory? Is preventing blindness different from increasing height? And what happens when different cultures draw these lines in different places? Can you define global rules for a field shaped by local values?

2. One Planet, Many Systems

Science is global. But laws are national. One country might ban germline editing entirely, another might rush to commercialize it, and many, perhaps most, are still undecided. So what's the goal here? Should UNESCO push for a binding international treaty? A set of non-binding ethical norms? A global registry of research? Is it even realistic to imagine consensus? And if not, can we at least build guardrails strong enough to prevent disaster?

3. Access, Justice, and the Right to Be Heard

You'll also need to ask: who is at the table, and who isn't? Most of the genome editing conversation is dominated by researchers, governments, and companies in high-income countries. Meanwhile, voices from the Global South, Indigenous communities, disability advocates, and youth are often left out. And yet these groups will live with the consequences of whatever rules (or lack of rules) are created. How do you ensure equity in a space that's already shaped by global power imbalances?

4. Whose Future Are We Editing?

Finally, you must grapple with the most profound question of all: what does it mean to make decisions for people who don't yet exist? Germline editing affects individuals who cannot consent, whose bodies, traits, and lives may be altered by choices made today. How do we protect their autonomy? How do we even define autonomy across generations? And what values do we pass on when we edit genes: resilience? perfection? sameness? compassion?

FURTHER RESOURCES

Universal Declaration On The Human Genome And Human Rights
https://www.unesco.org/en/legal-affairs/universal-declaration-human-genome-and-human-rights?hub=387

UNESCO Panel Of Experts Calls For Ban On "Editing" Of Human DNA
https://www.unesco.org/en/articles/unesco-panel-experts-calls-ban-editing-human-dna-avoid-unethical-tampering-hereditary-traits

He Jiankui And The World's First Gene-Edited Babies
https://www.youtube.com/watch?v=NRIs6xcqdEI&t=5s

"The CRISPR Children" Podcast
https://communities.springernature.com/posts/podcast-the-crispr-children-episode-1

CRISPR For Curious Minds
https://www.synthego.com/crispr-cuts/crispr-for-curious-minds

The Dark Side Of CRISPR - Scientific American
https://www.scientificamerican.com/article/the-dark-side-of-crispr/

Perspective: Embryo Editing Needs Scrutiny
https://www.nature.com/articles/528S6a

CRISPR & Ethics - Innovative Genomics
https://innovativegenomics.org/crisprpedia/crispr-ethics/

Funding CRISPR: Understanding The Role Of The Government & Philanthropic Institutions
https://arxiv.org/pdf/2009.11920

The Principle Of Procreative Beneficence And Its Implications For Genetic Engineering
https://www.researchgate.net/publication/362270223_The_principle_of_procreative_beneficence_and_its_implications_for_genetic_engineering

Regulating Genome Editing: For An Enlightened Democratic Governance
https://pmc.ncbi.nlm.nih.gov/articles/PMC6316359/

UK Scientists Edit Genes In Human Embryos: Catholics Respond
https://www.youtube.com/watch?v=SVhodie05H4