



Why were scientists silent over gene-edited babies?

To be successful as researchers, we must be able to think through the impacts of our work on society and speak up when necessary, says Natalie Kofler.

Millions were shocked to learn of the birth of gene-edited babies last year, but apparently several scientists were already in the know. Chinese researcher He Jiankui had spoken with them about his plans to genetically modify human embryos intended for pregnancy. His work was done before adequate animal studies and in direct violation of the international scientific consensus that CRISPR-Cas9 gene-editing technology is not ready or appropriate for making changes to humans that could be passed on through generations.

Scholars who have spoken publicly about their discussions with He described feeling unease. They have defended their silence by pointing to uncertainty over He's intentions (or reassurance that he had been dissuaded), a sense of obligation to preserve confidentiality and, perhaps most consistently, the absence of a global oversight body. Others who have not come forward probably had similar rationales. But He's experiments put human health at risk; anyone with enough knowledge and concern could have posted to blogs or reached out to their deans, the US National Institutes of Health or relevant scientific societies, such as the Association for Responsible Research and Innovation in Genome Editing (see page 440). Unfortunately, I think that few highly established scientists would have recognized an obligation to speak up.

I am convinced that this silence is a symptom of a broader scientific cultural crisis: a growing divide between the values upheld by the scientific community and the mission of science itself.

A fundamental goal of the scientific endeavour is to advance society through knowledge and innovation. As scientists, we strive to cure disease, improve environmental health and understand our place in the Universe. And yet the dominant values ingrained in scientists centre on the virtues of independence, ambition and objectivity. That is a grossly inadequate set of skills with which to support a mission of advancing society.

Of course, independence, ambition and objectivity are essential. My independence freed me to explore hypotheses about the cardiovascular system. My ambition got me through years of doctorate training and postdoctoral fellowships. Objectivity allows me to reduce bias when I collect and assess data. But there is a crucial distinction between managing experiments and thinking through their applications.

We need to be able to reflect on how our research fits into society. That requires not just our intellects, but also our emotions. I fear that, in the pursuit of objectivity, science has lost its heart.

Editing the genes of embryos could change our species' evolutionary trajectory. Perhaps one day, the technology will eliminate heritable diseases such as sickle-cell anaemia and cystic fibrosis. But it might also eliminate deafness or even brown eyes. In this quest to improve the human race, the strengths of our diversity could be lost, and the

rights of already vulnerable populations could be jeopardized.

Decisions about how and whether this technology should be used will require an expanded set of scientific virtues: compassion to ensure its applications are designed to be just, humility to ensure its risks are heeded and altruism to ensure its benefits are equitably distributed.

Compassion allows us to see the twin babies with altered genomes as living, breathing humans whose health (and whose future children's health) might be compromised. It lets us empathize with those little girls' parents and share their fear, anger, confusion and sense of injustice. Humility reveals how little we know about this nascent technology and the potential risks that these girls are now burdened with. And altruism allows us to see how rogue experiments could stall advances that might benefit people with life-threatening or heritable diseases.

Calls for improved global oversight and robust ethical frameworks are being heeded. Some researchers who apparently knew of He's experiments are under review by their universities. Chinese investigators have said He skirted regulations and will be punished. But punishment is an imperfect motivator. We must foster researchers' sense of societal values.

Fortunately, initiatives popping up throughout the scientific community are cultivating a scientific culture informed by a broader set of values and considerations. The Scientific Citizenship Initiative at Harvard University in Cambridge, Massachusetts, trains scientists to align their research with societal needs. The Summer Internship for Indigenous Peoples in Genomics offers genomics training that also focuses on integrating indigenous cultural per-

spectives into gene studies. The AI Now Institute at New York University has initiated a holistic approach to artificial-intelligence research that incorporates inclusion, bias and justice. And Editing Nature, a programme that I founded, provides platforms that integrate scientific knowledge with diverse cultural world views to foster the responsible development of environmental genetic technologies.

Initiatives such as these are proof that science is becoming more socially aware, equitable and just. We have come a long way since the days when the Tuskegee 'trials' withheld treatment from black men with syphilis to observe the late stages of the disease, and since Henrietta Lack's cancer cells were taken without her consent. But we still have a long way to go. Socially informed scientific initiatives need broader support from the scientific community, funders and policymakers. To truly advance science, we must unite with fire in our bellies and compassion in our hearts. ■

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